THE
ELECTRICAL REVIEW

THE OLDEST ELECTRICAL PAPER
ESTABLISHED 1872

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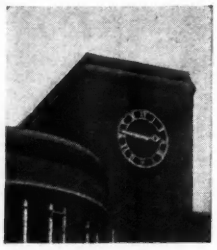

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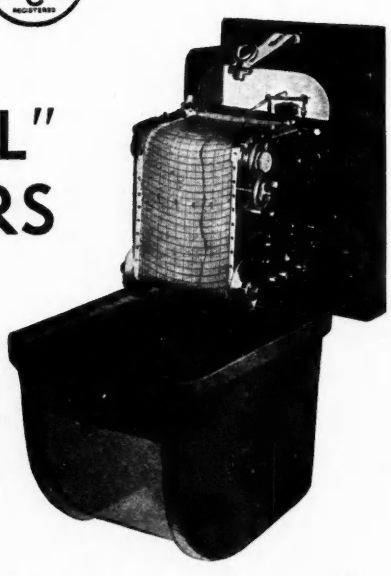

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THE
ELECTRICAL REVIEW

THE OLDEST ELECTRICAL PAPER — ESTABLISHED 1872

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The Gas-Electricity "Truce"

Economics or Expediency?

WE have already commented upon certain aspects of the "truce" which was arranged some time ago between representatives of the electricity supply and gas industries, but there are other considerations which justify a return to the subject. It will be recalled that the *rapprochement* arose out of the proposal to ration supplies. We are still not quite sure what interests were consulted, or when, before the Fuel Order was made, but judging by the nature of the Order the gas people had the greatest say and actually secured exemption from rationing for a very substantial proportion of their consumers (those with prepayment meters), while only lighting prepayment consumers of electricity were exempt. In any event, both parties considered that rationing was undesirable, and jointly interviewed the Mines Department to tell them so.

The combination resulted from a joint invitation by the Secretary for Mines, although in point of fact the arguments of each side against rationing were widely different, and could have well been presented separately. It is important to note that this interview took place after the publication of the Order. If the consultation had been made in advance of the Order much waste of time, labour and money would have been avoided.

Modifying Competition

However, having got the two parties together, the Minister hinted that uneconomic competition between them had got to stop or as he put it "a decision of the two industries to reach agreement in regard to their activities would be a valuable contribution towards national co-operation." The delegates, by now a Joint Committee, set out to find some means of obeying the Minister's behest. The result of their deliberations was the somewhat elaborate report which we summarised in our issue of March 22nd. But for all its elaboration all that it contained (apart from two memoranda on the subject of rationing) was a recommendation that the two industries should not disparage one another in their advertisements and canvassing. We have always deprecated this form of advertising, and there has not been a great deal of it in recent years. Surely a cyclostyled circular to the gas and electricity undertakings would have sufficed to put a stop to it.

But really vituperation cannot be considered uneconomic competition. The impression gained, therefore, is that the memorandum was either produced as a gesture designed to satisfy the Mines Department that something was being done or else it signified something more than can actually be discovered in it. The Committee's recommendations were accompanied by some observations. One was to the effect that "while the Joint Committee feel that each industry should continue to maintain all proper contact with its consumers and should also be active in regard to new business as wartime conditions may from time to time seem to justify, they also feel that the understanding might with advantage in present circumstances lead to arrangements in each locality designed to prevent the displacement of the existing apparatus of either industry."

Who Benefits?

It is this suggestion which the Committee did not feel able to include in its recommendations which seems to have dire possibilities in it. Hitherto, of course, the great advance in the domestic use of electricity has been made largely at the expense of gas and there has been little movement in the other direction. And it is the domestic side which is primarily concerned in this matter.

It follows that the cessation of competition would operate in favour of the gas industry, and this may account for the *volte face* of the gas Press in dealing with the matter. When the truce was first mentioned both of the leading gas journals threw cold water upon it. But recently the *Gas Times* has come to consider it a most desirable move, and has actually reproached the electrical Press for its lukewarm reception of the proposals.

Our lack of enthusiasm arises from our knowledge of the troubles already encountered by the "domestic" side of the electrical industry First the threat to ration supplies and then the restrictions placed upon expenditure by supply undertakings, combined with the natural reluctance of consumers to take on new commitments in wartime, have all had serious effects. No doubt the gas industry has had to face the same problems, but that is no reason why we should leave what business there is to gravitate towards the gas mains. As we have pointed out previously, if sales activities are abandoned by both industries, it is the older and better-established one

which will benefit. It may be desirable that one party should not endeavour to displace the other's apparatus, but such action is not necessarily uneconomic. It may easily be the reverse: change-overs are often made for that reason. Our real fear, however, is that the truce is merely the prelude to something more ambitious. The gas industry, alarmed at electricity's progress in fields which it once dominated, has long wished for a demarcation of "spheres of influence," or even more. Mr. G. Dixon, President of the Institution of Gas Engineers, at a gas managers' dinner last week, said that he was satisfied that in the future there would be a definite understanding as to the fields which "rightly belonged" to each industry. There was no doubt, he went on, that when it came to a question of heat the gas industry would supply that need "and when it came to other things equally important their friends of the electricity industry were going to have their place." The war provides an opportunity for a furthering of this idea, and we feel that it is our duty to say that it bodes no good to the electrical industry—particularly the manufacturing and contracting branches. We cannot think that those who have made these proposals have the authority and backing of the electrical industry, the future of which appears to be seriously compromised.

Blackburn's Warning

RECENT events at Blackburn emphasise the need for watchfulness. The Gas Department there has not been doing so well and it is thought by a majority of the Council that the combination of the gas and electricity undertakings under a joint manager would help to wipe out the accumulated deficit. The Council is debarred from taking the electricity profits to balance the gas loss and so this scheme is thought of. Naturally the chairman of the Electricity Committee and the borough electrical engineer were not in favour of it and indeed had not been consulted beforehand, but they were over-ridden. Against this the leader of the Council who introduced the scheme said that it had "a 100 per cent. support of the borough treasurer and the good wishes of the gas engineer"—which was not surprising, for borough treasurers very frequently view the independence of electricity departments with a baleful eye. It can be taken as axiomatic that where joint control is projected it is the gas undertaking which is to benefit.

It Must Go On

THE manufacturers' view of the part which domestic development plays in the structure of the electrical industry is well put in the March *B.E.A.M.A. Journal*. Here it is said that, contrary to general expectations, the domestic market has not stagnated. Demand continues to be active, more particularly for room heating, cooking and water heating. It is essential that this should be maintained; not only because of its importance to electricity supply but also to electrical manufacture. To enable British manufacturers to export, it is vital that the home demand for apparatus be continued and encouraged. No industry, however efficient, can produce economically for the export market alone. Although the domestic load represents only approximately 25 per cent. of the total units sold. it has a very important effect upon the revenue of the electricity supply industry. Despite the depressing effects of the wartime regulations, of retrenchment and shortage of materials, the load building effort cannot be relaxed. The *Journal* backs Mr. F. W. Purse's appeal for a renewal of publicity and propaganda "with 100 per cent. support to E.D.A."

Smoke of War

ENHANCED industrial activity consequent upon the war was stated by Dr. J. J. Jervis, M.O.H. Leeds, at the Manchester meeting of the National Smoke Abatement Society, to have considerably aggravated the smoke nuisance. He attributed this largely to the commissioning of new factories and the extension of existing ones, inferior coal and faulty stoking. We should have expected the deterioration of the atmosphere to have been due to the forcing of obsolete boilers in private plants and to the expansion of processes that cannot economically be carried out with electricity. No doubt the domestic hearth also contributed its share to the fogs that accompanied the cold spell when, Dr. Jervis reports, the death rate in Leeds from respiratory diseases soared. On the other hand, most new works and extensions would be fully electrified, power being supplied from public or private generating stations. In either case, even the poorest coal can nowadays be burned innocuously by mechanical means under skilled supervision. It is probably nearer the mark to point out, as he does, that the application of anti-smoke by-laws has been made more difficult by shortage of staff and other circumstances. Whatever may be the main factor in the increase of soot in the air recently, however, it is welcome news in the cause of health and of avoidance of the waste that smoke implies that the Society is to continue its good work.

Common Sense at Woolwich

THE chairman of the Woolwich Finance Committee told the Borough Council last week that deficits on the electricity undertaking for 1939-40 and 1940-41 would have to be met. It was proposed to do this from the reserve fund instead of increasing charges, and no contribution would be made to the rates. He went on to make the following remarks which echo sentiments that we have expressed for many years past:—

> "If the rebate was discontinued and a small increase made in the tariff, the electricity accounts would show a profit which would be available for rate relief, and we could keep the rate at 14s. 1d. This would mean, however, that domestic consumers of electricity in the borough would be providing the increased cost of civil defence, the loss of rate income due to evacuation, and the effect of the increase in assessable value, as compared with rateable value, to which I have previously referred. We feel that this increase should be borne by the whole body of ratepayers and not by the domestic consumers of electricity."

Perhaps the effects of the war upon finances may bring other undertakings to a realisation of the iniquity of extorting extra rates from electricity consumers.

Wood-pole Insulation

OFFICIAL encouragement of extended rural electrification, coupled with the need to exercise rigid economy in present conditions, has reawakened interest in the possibilities of unearthed and unbonded wooden poles for overhead lines. While additional insulation is provided in this way, there remains the question of the increased risk of fire and shock thus introduced. It is true that satisfactory results have been obtained with this form of construction in other countries, but the vagaries of our climate have to be taken into account. The tests described by Mr. G. T. Garwood in his article this week indicate the nature of the risks to be expected in this country. They should be distinctly helpful in devising methods of counteracting hazards which come into play in certain combinations of circumstances, and offset the considerable advantage of a smaller chance of insulator failure when the pole is not earthed. Insulation strength then becomes of increased importance, and two I.E.E. Transmission Section papers reported in this issue are relevant to the subject.

British Standards

WHAT an admirable example of the way to reconcile the age-long antagonism between ordered centralisation and the creative diversity of individualism is shown by the British Standards Institution! In his address to the Mining Electrical Engineers, Mr. Percy Good, after enunciating the fundamental principles on which the work of the Institution is based, justifiably claimed that an understanding of these ought to be part of the equipment of reformers of any kind. As a link between Government and technicians the B.S.I. is now proving its value in another way.

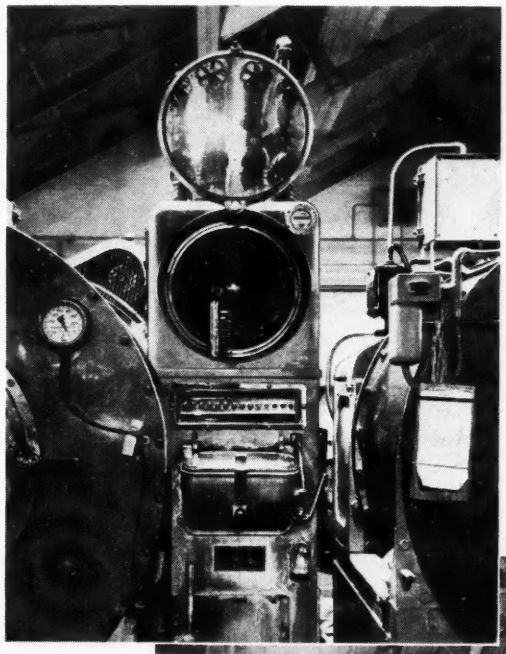
ELECTRIFIED LAUNDRY

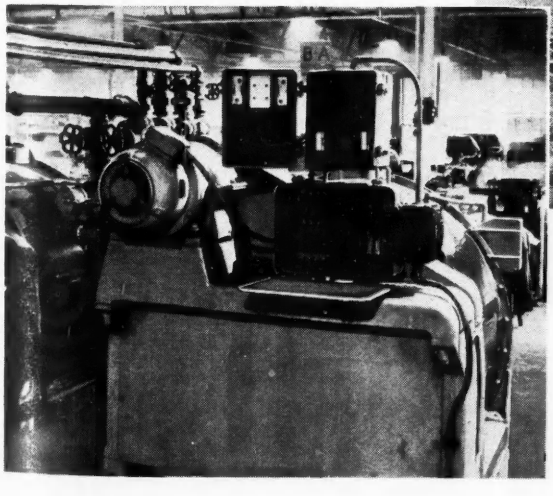
Interesting Automatic System for Controlling the Supply of Solutions to the Washing Machines

AUTOMATICALLY controlled feeding of the washing materials and solutions to the washing machines, special attention to variable-speed and reversible drives and the absence of the humid atmosphere associated with so many laundries are points which we noticed particularly when we recently visited the new establishment at Nottingham of the Midland Co-operative Laundries Association, Ltd.

The laundry has been designed to deal with about 460,000 lb. (dry weight) of garments, &c., per week, which represents an installed motor horse power of about 280, mostly in small units totalling about 100. This power installation, together with about 40 kW of lighting, bells and clocks, embraces about 15½ miles of cable supplied by the Edison Swan Electric Co., Ltd., and British Insulated Cables, Ltd., and three miles of steel conduit and 3,500 conduit fittings supplied by Walsall Conduits, Ltd.

The processes are continuous. The clothes are passed through as a batch or journey at a time, a journey consisting of about 500 parcels each containing an average of 10 to 12 pieces (the average weight of a piece is 1.65 lb.). It takes six hours to deal with a batch from start to finish. Classifying the pieces according to the required washing formulæ and marking them, when necessary, for identification of ownership may be seen in the first group of operations. Two lines of bins serve for the sorting work and are arranged with the marking machines on either side of a central conveyor which delivers the pieces as required for treatment in the washing machines. The conveyor is driven by a 1-HP squirrel-cage Laurence Scott motor, served by a "Memota" push-button contactor switch.





Above: Motor-driven contact disc for automatic control of the feeding of solutions to the washing machine. Right: A line of automatically fed washing machines. Below: Reversible drive of a washing machine showing transformer for the automatic feeding equipment and underneath it the control panel for reversible motor complete with time switch.

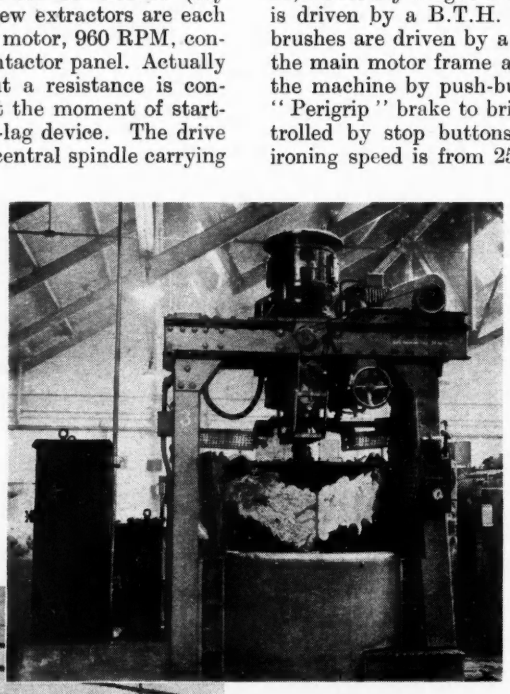
Each Baker Perkins "Prosperity" washing machine has a cylindrical cage with internal baffles, and this is revolved about six times, first in one direction and then similarly in the other by an automatically controlled B.T.H. reversing motor directly coupled to a reduction gearbox with V-belt transmission to the washer cage. The actual reversing is governed finally by an Everett Edgcumbe "Synclock" via contactors all neatly arranged in an ironclad case mounted on the washer.

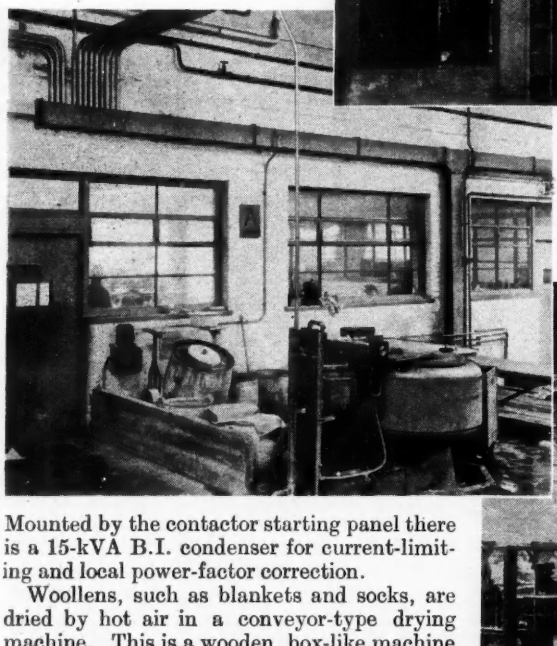
Automatic control of the feeding of the washing materials is of special interest. A small 25-V Klaxon motor drives an insulated disc in which there are slots through which electrical contacts are made between fingers at the front and a copper plate at the back of the disc. The contacts operate solenoids which, in turn, open needle valves by which compressed air is supplied to the valves governing the supply of washing solutions to the machine. By means of push-buttons it is possible to operate the magnets directly.

The supplies of soap, soda, blue, hot and cold water and steam and the outlet are all controlled in this way. As soon as a solution magnet is energised the motor driving the disc stops and the disc drive is taken up by a water meter through an ingenious free wheeling arrangement. The amounts of the various materials supplied to the machine are regulated by the lengths of the disc slots, i.e., the time of the electrical contacts, and the slots on one disc are made according to a formula set up by chemists. Each formula (one disc) is designed for a definite amount of washing of one class of pieces. The solutions are fed to the automatic washing machines by gravity from

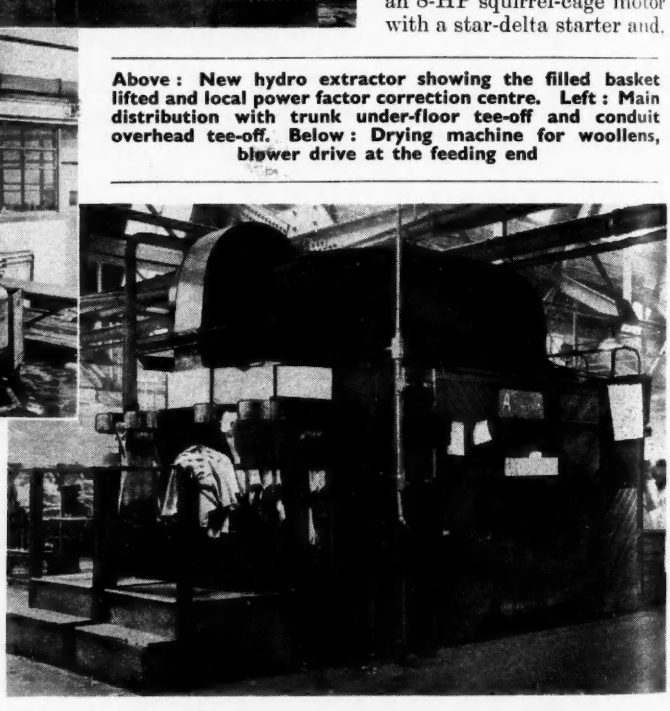
700-gal. overhead mixing tanks. There are three sizes of washing machines with capacities of 200, 100 and 35 lb. dry weight, driven by 2½, 1½ and 1-HP motors, respectively. A 400/25-V transformer on the machine serves both the disc motor and the solenoids.

Cleansed pieces from the washing machines are partially dried in Watson Laidlaw hydro extractors, including some with the latest development by which the dried clothes are lifted from the actual basket in a four-compartment core, each segmental compartment of which will accommodate 65 lb. of clothes (dry weight). The largest of these new extractors are each driven by a 28-HP squirrel-cage motor, 960 RPM, controlled by an Edward Holme contactor panel. Actually it is a direct-on-line motor, but a resistance is connected across the phases just at the moment of starting up and is cut out by a time-lag device. The drive is through a friction clutch to a central spindle carrying the baskets. When the motor stops safety guards are lifted and gearing is put into operation which drives the basket-lifting gear. This is operated by push-buttons and the travel is restricted by limit switches. While the lifting gear is in operation the motor cannot be run on account of electrical interlocking. The main motor is also push-button controlled and there is automatic control for the duty cycle which covers a time range of about six minutes from stop to stop.





Above: New hydro extractor showing the filled basket lifted and local power factor correction centre. Left: Main distribution with trunk under-floor tee-off and conduit overhead tee-off. Below: Drying machine for woollens, blower drive at the feeding end



Mounted by the contactor starting panel there is a 15-kVA B.I. condenser for current-limiting and local power-factor correction.

Woollens, such as blankets and socks, are dried by hot air in a conveyor-type drying machine. This is a wooden, box-like machine with an internal conveyor at each side. The conveyors are driven by a 2-HP motor controlled by an Ellison "Bantam" switch. Hot air is first drawn through a steam heater and then blown through a duct between the two conveyor lines by a Keith Blackman fan driven by a 10-HP squirrel-cage motor with a star-delta starter. On each conveyor there is a limit switch which prevents articles from travelling back into the machine.

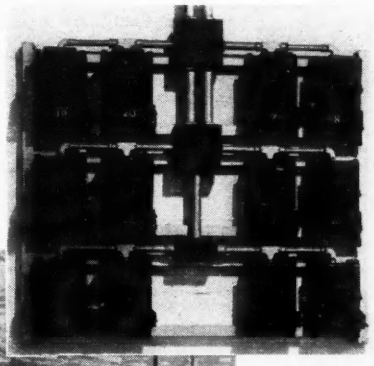
Articles from the hydro extractors, after being classified according to the types of machines on which they are later to receive treatment, are passed on to the ironing room. It will be sufficient to select a few of the machines in this room for mention. A table-linen ironer for the best-quality work consists of two padded rolls running in polished beds over which the pieces are conveyed. The first roll removes moisture and the second polishes the cloth. The beds are heated by steam supplied at 100 lb. per sq. in. and the rolls are fed with steam at 10 lb. per sq. in. A 4-HP variable-speed slip-ring motor drives the roll through reduction gear and the speed is varied by a Brookhirst contactor unit to suit the class of work under treatment. The ironing speed is from 25 to 50 ft. per minute.

For general-purpose work, such as sheets there are similar machines with 8 and 6 rolls each. Each machine has a team of 18 to 20 girls and is capable of handling 12,000 lb. dry weight every hour. An eight roll machine is driven by a B.T.H. AC commutator motor whose brushes are driven by a small pilot motor mounted on the main motor frame and controlled from the front of the machine by push-button. The main motor has a "Perigrip" brake to bring the rolls to rest and is controlled by stop buttons and the finger guard. The ironing speed is from 25 to 60 ft. per minute and the motor speed range is from 300 to 1,400 RPM. Transmission to the rolls is by four Renold chains, one to one of each pair of rolls which, in turn, drives its neighbour. The rolls are lifted from the beds by compressed air, the bearing being pivoted on one side and raised on the other side by an air piston. The chain drives have jockey pulleys to provide the necessary adjustment during both lifting and working operations.

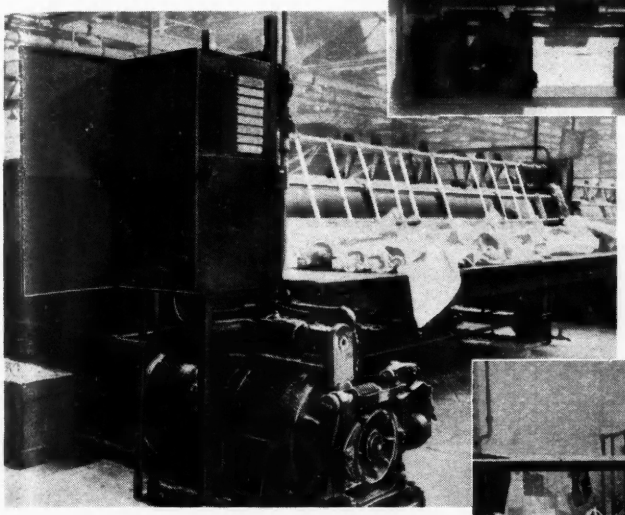
In the collar section we saw the only group drive in the laundry. It is too costly to permit unit driving for such small machines. It is an 8-HP squirrel-cage motor with a star-delta starter and, via counter shafting, drives a gas compressor, two automatic blocking machines on which a table laden with collars works to and fro under a heated roller, a polishing machine, a turner and shaper, a goffering machine with a pair of corrugated rolls which puts the crinkles into housemaids' hats, machines which deal with the neck bands of dress shirts and a shirt-front ironer which has a curved table operating to and fro under a heated roll. All these machines are on a line shaft and for safety the motor starter is at one end of the shaft and a stop button at the other end.

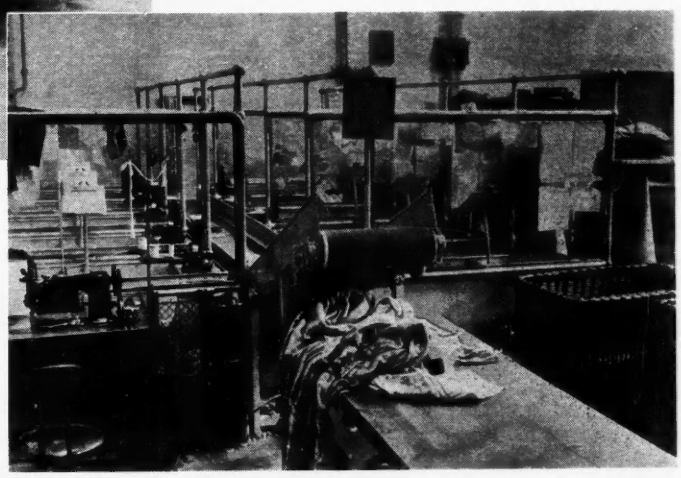
In a section of the ironing room devoted entirely to general wearing apparel all the machines are operated by compressed air supplied from a motor-driven compressor. This has a capacity of 80 to 160 cu. ft. per minute, at 80 lb. per sq. in. and is driven by a 35-HP, 355-RPM, G.E.C. slip-ring motor which runs continuously, while the compressor ports are opened and closed automatically according to the pressure in the air receiver. An Ellison rotor switch unit serves the motor.

The compressed air presses are sometimes arranged in units of, say, three presses for dealing with more complicated garments. Ironed pieces are passed to racks in piles corresponding to the bundles in which they were received at the unloading dock, and after being checked and packed they are placed on a conveyor system which serves the despatch dock. The two lines of this system, about 180 ft. long, are driven by a 5-HP slip-ring geared motor with a chain drive to a sprocket wheel which, in turn, drives a conveyor drum on either side.



Bank of contactor starters for ventilating fans





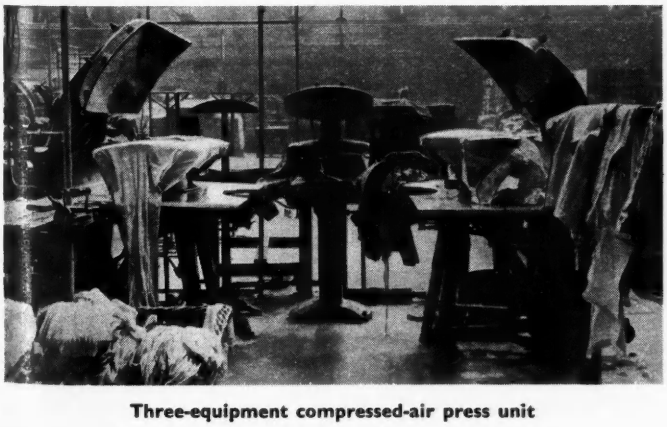
Above: Variable speed is provided for an 8-roll ironer by an AC commutator motor with an incorporated brush motor. Right: Marking and classifying section, with central conveyor

Steam is supplied by two Daniel Adamson boilers with Proctor automatic stokers. A 5-HP squirrel-cage motor with star-delta control drives both the coal conveyor and the stoker. The visitor accustomed to process-steam installations is at once aware of the absence of the usual humid atmosphere, particularly if he wears glasses. This is accounted for by the special attention given to heating and ventilation. There are twelve 36-in. inlet fans and every alternate one of these has a steam-heating unit in front of it. These inlet fans are fixed in the packing department wall. Half-way down the laundry there are twelve 36-in. extract fans built into the roof and over the washing machines there are twelve similar fans. All these fans are driven by Matthews and Yates 2-HP motors controlled by single units each consisting of an M.E.M. switch-fuse and an automatic "Memota" push-button starter. The laundry is divided into four sections and there is one set of starters conveniently banked for each, so that any of the bays of the laundry can be catered for separately to give a really flexible system.

Supply is taken at 440 V from the Nottingham Corporation electricity undertaking direct on to a metering panel, and via two Ellison "Industrial" pedestal oil circuit-breakers (500-A and 100-A for power and lighting, respectively) is supplied a 90-way, three-phase power board equipped with Artic fuse units varying in size from 25 to 60 A. There are also nine 30-A single-phase units for heating and nine 30-A single ways for lighting. The idea behind this design is to give central control of the whole installation in view of the necessity at times of rearrangement of the laundry plant layout. The Artic fuse units are mounted on Sindanyo panels and over the board there is a diagram of the distribution arrangements with numbers corresponding to those of the actual fuses.

Cables from the distribution board are taken through the substation wall in a trunking system which is extended along the wall of the laundry. A tee-off from the main trunking is taken down the wall and along a trench at the foot of the line of washing machines, while conduits from the main trunk direct are taken overhead to other machines. The conduit connections to the trunking are made by smooth-bore bushes. In addition to the local power factor correction scheme referred to, main power-factor correction is provided by a 85-kVA B.I. condenser in the laundry substation.

We are indebted to the Midland Co-operative Laundries Association, Ltd., for permission to visit the laundry, and to Mr. W. G. Blackburn, manager, for his help in the collection of this information and the taking of photographs.



Three-equipment compressed-air press unit

INDUSTRIAL SINGLE-PHASE LOADS

By G. W. Stubbings, B.Sc., A.M.I.E.E.

A SINGLE-PHASE supply at line voltage can be obtained very simply from a three-phase three-wire main by connecting the single-phase load to two of the three-phase lines, the single-phase current being superposed on two of the line currents of the three-phase load (fig. 1). An alternative method of connecting a single-phase load is to derive the single-phase supply from one line and the mid-point of an auto-transformer joined to the other two (fig. 2). The single-phase voltage is $\sqrt{3}/2$ of the line voltage, and the current per single-phase kVA is greater than that corresponding to the fig. 1 connection in the ratio $2/\sqrt{3}$.

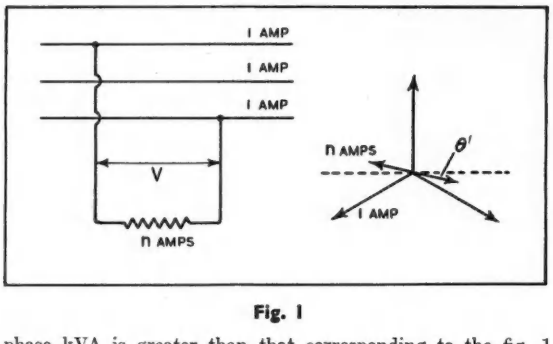


Fig. 1

With the indirect connection the single-phase current is carried by all three lines, and, because of this better current distribution it would appear that the line losses and the voltage regulation per kVA of single-phase load are less than with the direct connection. This conclusion is, however, erroneous, and there is no practical justification for the complication of the former.

This proposition can be established by a very short argument, and this argument will be perfectly general if it be assumed that a single-phase load of n amperes at line voltage is superposed on a balanced three-phase load of 1 A. In the vector diagram for the direct connection (fig. 1), θ is the difference between the phase angles of the single and three-phase loads. The line loss per ohm of line resistance is equal to the sum of the squares of the line currents of the resultant load. The squares of the line currents are seen, from fig. 1, to be, 1, $\{1+n^2+2n\cos(30+\theta)\}$ and $\{1+n^2+2n\cos(30-\theta)\}$. By expanding the cosine terms the sum of the squares is found to be $3+2n^2+2\sqrt{3}\times n\cos\theta$.

With the indirect connection (fig. 1) the single-phase currents superposed on the balanced load are $2n/\sqrt{3}$, $n/\sqrt{3}$, and $n/\sqrt{3}$, and the squares of the line currents are $1+4n^2/3+4n\cos\theta/\sqrt{3}$, $1+n^2/3+2n\cos(60+\theta)/\sqrt{3}$ and $1+n^2/3+2n\cos(60-\theta)/\sqrt{3}$. The sum of these squares comes out at $3+2n^2+2\sqrt{3}\times\cos\theta$, the same as with the direct connection.

This short calculation shows that, as regards additional line loss, there is no advantage to be gained by the complication of the indirect connection. As voltage regulation is related to line loss, it may be concluded that the percentage single-phase voltage drop per kVA of single-phase load will be the same for the two connections. On no ground, therefore, is the indirect connection justified, and no advantage is obtained by the use of an auto-transformer to distribute the single-phase current between the three lines of the supply main.

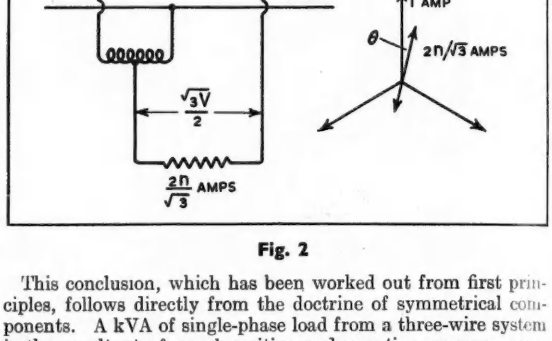


Fig. 2

This conclusion, which has been worked out from first principles, follows directly from the doctrine of symmetrical components. A kVA of single-phase load from a three-wire system is the resultant of equal positive and negative sequence symmetrical components, the magnitude of which is independent of how the single-phase supply is derived. As the line loss due to an unbalanced load depends upon the sum of the squares of its symmetrical components, the conclusion, already established, follows immediately.

Centralised Control of Coal Washing

FOR installations employing a large number of motors, distributed over a large area, or on several floors, it is often expedient to centralise control instead of mounting each individual starter in close proximity to its motor. An example is the coal-washing plant at one of the pits of Glass Houghton and Castleford Collieries, Ltd., for which the electrical equipment was supplied by the General Electric Co., Ltd. The contract included power and lighting transformers, high-voltage oil-immersed switchgear, contactor control gear operated from remote push button cubicles, and over forty motors with a total output of nearly 300 HP.

Centralised control for this class of plant permits of the use of a separate switch house remote from the washery so that dust and dirt are eliminated; open type contactors can, therefore, be used, thus facilitating inspection and maintenance. The starting and running of the plant is simplified. It is only necessary to provide a main power cable to the contactor board, from which smaller cables are run to the motors and multi-core cables to the push button stations.

The 3,300-V incoming AC is controlled by two oil-immersed industrial circuit-breakers of the horizontal draw-out pattern, from which feeders are taken to a 75-kVA transformer for the 110-V lighting circuits and a 500-kVA power transformer which steps down to 440 V for a four-unit oil-immersed industrial switchboard, feeding three contactor switchboards controlling motors for the washery plant, wagon tippler, and coal-handling equipment.

In view of the dust and dirt, all the motors in the washery are of the totally enclosed fan-cooled design; they range from ½ to 20 HP. With the exception of three slip-ring machines, they are of the squirrel-cage type with contactor starters mounted on a flat-back switchboard in a separate house remote from the coal-washing plant. Each squirrel-cage motor is switched direct to the line, the equipment comprising a triple-pole contactor with adjustable thermal overload trips, a triple-pole isolator, and three high rupturing capacity fuses enclosed in porcelain shields and rated at 25,000 kVA. These fuses are a safeguard against short-circuit conditions. An ammeter is provided for each machine and the control equipments are mounted in groups of three, one above the other on panels. The three slip-ring motors have triple-pole contactor type rotor starters, each on a separate panel of the switchboard. The rate of acceleration is governed by a clockwork timing mechanism and open type contactors are used throughout.

All starting is remote from six push-button cubicles in the washery. Each cubicle controls a number of motors with a pilot indicating lamp for each motor and an emergency "stop" button which enables the attendant to shut down the complete installation. The cubicles are of sheet steel, floor mounted and dustproof.

X-raying Cables

A VIEWING machine is being employed by the Simplex Wire and Cable Co. of America to determine whether the conductors in high-voltage cable are properly centred. It consists of a Westinghouse X-ray outfit installed as a "regular production-line tool," the cable passing through it as it leaves the machine that applies the insulation. An operator sits watching two fluorscopic screens, which present views of the cable interior at 90 degree planes. When a doubtful section of cable is observed the operator presses a switch that exposes two X-ray films, at the same time marking the particular cable section so that it can be rejected if the photographs confirm the visual observation that the conductors are too far from the centre.

TESTS ON WOOD POLES

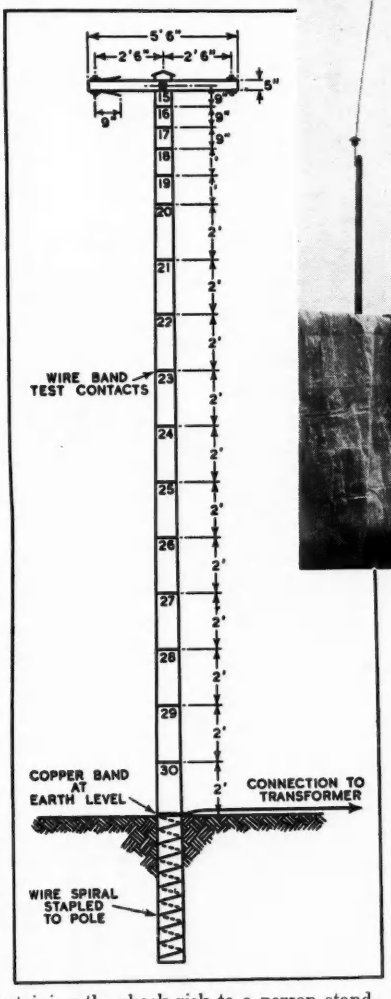
Determining Shock and Fire Risks

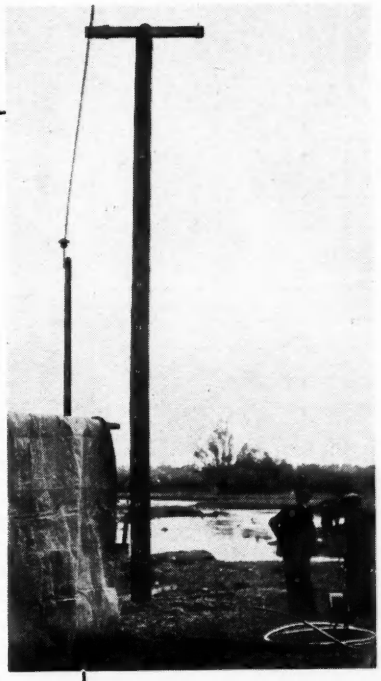
By G. T. Garwood, B.Sc., A.M.I.E.E.

UNEARTHED and unbonded wood-pole line construction, recently permitted by the Electricity Commissioners, will probably come in for increased attention in connection with new high-voltage lines erected under present conditions, owing to the capital economy and the reduction in steelwork which it admits.

Lines of this sort may also be expected to offer certain operational advantages due to the supplemental insulation provided by the wooden supporting structure. These advantages are:—Substantial reduction in insulator failures due to lightning; fewer supply interruptions due to bird contacts and the like; the possibility of the line continuing in operation notwithstanding insulator failure on any one phase. Against these advantages must be set the risks to persons and animals of shocks from the pole in the event of insulator failure and of the pole itself taking fire.

In the absence of data on the incidence of these risks and on the electrical conditions established in the supporting structure as a result of failure of primary insulation, three series of tests, each at 19, 11 and 6.35 kV, were undertaken to procure first-hand information. The tests were conceived and carried out in a strictly practical spirit and do not purport to be a rigorous examination of the subject.





Pole structure showing facilities for testing, and (above) test pole in foundation

The first tests were directed to an examination of the distribution of potential along a typical pole and wood crossarm under the conditions of an insulator failure on one phase. This information was desired for the following purposes: (a) To form a general conception of the electrical conditions in the pole; (b) to make a preliminary assessment of the shock risk and the fire risk; (c) to locate the steepest voltage gradients (as sources of fire risk) for guidance in design and construction; (d) to examine the possibility of reducing the voltage gradient in the neighbourhood of the insulator pin (believed to be the principal source of fire risk) by means of a simple electrostatic shield.

The second series was directed to ascertaining the shock risk to a person standing on the ground and making contact with the pole under the same conditions. (The effect of an earthing collar around the pole was also explored in connection with these tests.) The third test, relating to fire-destruction, was carried out concurrently with the second.

The structure on which the tests were carried out comprised a plain-sawn English oak crossarm, 5 by 3 in., bolted to a red-fir pole, 32 ft. by 11¼ in. in diameter at 5 ft. from the butt. The pole, in every way normal, clean and sound, was about eight years old and had been originally creosoted to B.S. Specification by the Ruping process. Prior to being set up for test, it had been exposed to a spell of dry, north-easterly winds and was probably as dry as a pole is ever likely to be in this country.

Testing Arrangements

At one end of the crossarm the insulator spindle (actually, a ¾-in. bolt, as no insulators were to be carried) was mounted on the crossarm in the ordinary way, except that two 3 by 3 by ¼-in. washers were very tightly clamped down on the crossarm, under the bolt head and under the nut so as to provide a substantial contact area with the oak. The other end of the crossarm was equipped in the same manner except that, between the washers and the crossarm, were clamped the thin sheet-steel electrostatic shields.

The crossarm was tightly bolted to the pole in the ordinary manner, with a 2½-in. square washer under the bolt-head and under the nut. The pole was notched to receive the crossarm, so as to provide good wood-to-wood contact over about 20 to 25 sq. in. In order to avoid stray capacities not corresponding to practical conditions, potential was conveyed to the insulator pin of the pole under test from a short horizontal span of wire, about 80 ft. long. The test pole was mounted in about the middle of the span.

Facilities for making electrical contact with the structure at the test points were as follows. In the crossarm fine transverse slots about $\frac{1}{16}$ in. deep were made at intervals on the upper and lower surfaces, along what were expected to be equipotential lines and in these slots were caulked No. 24 SWG copper wires. The upper and lower wires in the same transverse plane were connected to an ordinary cup-hook, screwed into the lower edge of the crossarm and in the same plane. Potential readings for the crossarm were taken from these cup-hooks to earth.

Test contacts on the pole consisted of circumferential bands of 7/.064 stranded copper wire, tightly twisted into contact with the wood and equipped with cup-hooks for the convenient attachment of the voltmeter lead. To eliminate any doubtful earth connection at the base of the pole one terminal of the testing transformer was connected to a copper band tightly clamped around the pole at ground level, and a copper wire attached to this band was stapled around the pole butt.

Potential Tests

The instruments used for these tests were two Everett Edgcumbe electrostatic voltmeters, one for the higher readings and one for the lower, both recently recalibrated. The procedure consisted of connecting the voltmeter lead to the appropriate test point, switching on, taking the reading, and then switching off. The potential curves reproduced took about three hours to obtain, but the total time for which the pole was energised was less than a quarter of an hour; the pole was dry throughout. Almost without exception, the actual observations fell on the mean curves shown.

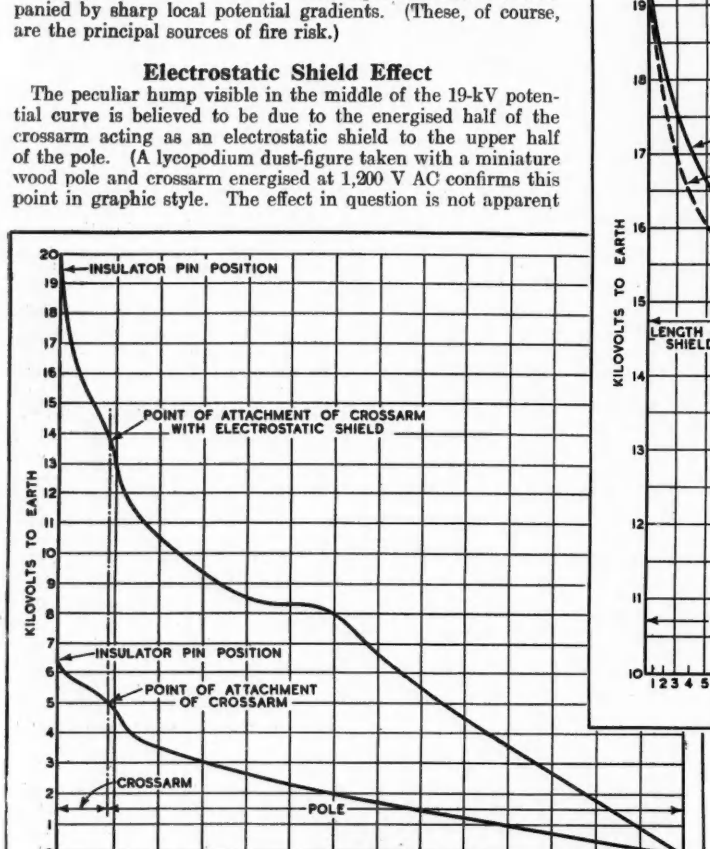
Two 19-kV curves were plotted for the end of the crossarm only. One of these was obtained from the end of the crossarm equipped with the electrostatic shields, and the second from the other end. The effect of the shields was to halve, approximately, the potential gradient near the insulator pin,

but it became apparent later that the shields would be quite incapable of preventing the pole taking fire under the general conditions of these tests. Circumstances can be conceived, however, in which some such device would be of practical utility.

The potential curves obtained can be readily interpreted if it be borne in mind that the straight-line curve obtainable from a conductor or semi-conductor of uniform cross-section becomes roughly hyperbolic with a tapering conductor, such as a pole; also that at joints (such as that between the insulator pin and the crossarm, and between the crossarm and the pole) there will be more or less imperfect contact accompanied by sharp local potential gradients. (These, of course, are the principal sources of fire risk.)

Electrostatic Shield Effect

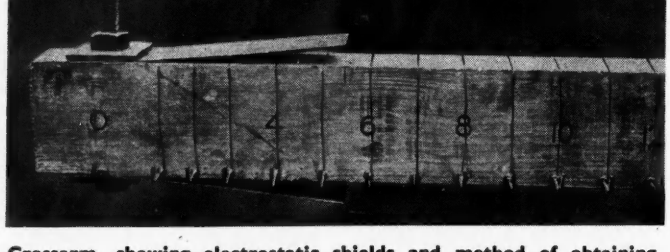
The peculiar hump visible in the middle of the 19-kV potential curve is believed to be due to the energised half of the crossarm acting as an electrostatic shield to the upper half of the pole. (A lycopodium dust-figure taken with a miniature wood pole and crossarm energised at 1,200 V AC confirms this point in graphic style. The effect in question is not apparent



Potential curves, obtained from hole and crossarm at 19 and 6.35 kV.

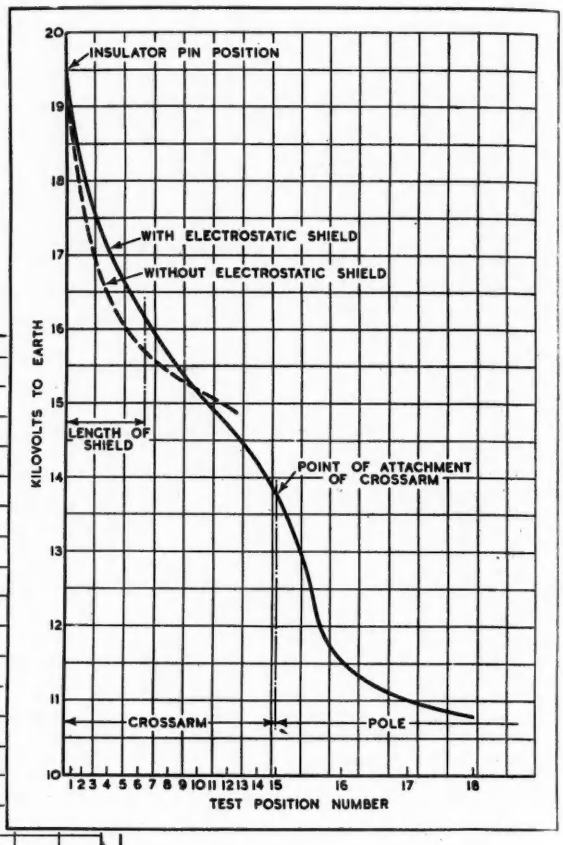
on the 6.35-kV curve, as might be expected.) After the above tests the pole and crossarm were examined for burning. There was some very slight incipient charring at the pole-crossarm connection, while the crossarm itself, though not charred, had the appearance of being "sweated" as by moist heat.

Current tests were taken later and with an 11-kV crossarm 36 by 4 by 3 in. but otherwise similar to the crossarm already described, both as to material and method of fixing. (No electrostatic shields were applied in this case.) The current-to-earth tests were taken at 11 kV throughout because, the system being equipped with a Petersen coil, occasional operation with two phases at that voltage to earth would not be uncommon.



Crossarm, showing electrostatic shields and method of obtaining electrical contact.

During the potential tests one or two preliminary readings of current to earth from the pole were taken. As the magnitude of these implied a pole-resistance lower than was anticipated, the resistance between the crossarm bolt and earth was measured on frequent occasions in the intervening period and under varying conditions of dryness, "Megger" readings ranging from 200,000 ohms with the pole dry to 50,000 ohms with it wet were obtained. Four other line poles, of similar dimensions, which had been creosoted about ten days previously and had been erected and exposed for about eight days in dry weather, gave readings under similar test varying from 120,000 to 900,000 ohms.



Potential curves at 19 kV for end of crossarm only

The following current tests were taken through a "dummy-man" circuit, i.e., a circuit approximating in resistance and contact conditions to a man standing with wet boots on wet ground near the base of the pole and leaning on it with one hand. The body resistance of the "dummy-man" was represented by two 25-W, 230-V vacuum lamps in series having a nominal resistance of 4,000 ohms (actually 4,120 ohms when cold and 4,318 ohms at rated voltage). The hand of the "dummy-man" was represented by a brass pad, 6 by 3 in., shaped to the pole, lined with thick felt and moistened with a weak saline solution. The pad was pressed to the pole manually by means of an insulated rod. Several sets of current tests were taken, of which the following is an abridged account.

(1) The pole having been wetted on one side by rain, the insulation resistance from crossarm bolt to earth was measured and was found to be 50,000 ohms.

(2) With the 11-kV connection on the insulator pin, the contact pad (with the 4,000-ohm resistor in circuit) was applied to the wet side of the pole at various heights from the ground, giving the following current values: 2 ft., 9 mA; 4 ft., 11 mA; 6 ft., 17 mA; 8 ft., 21 mA; 10 ft., 23 mA; 12 ft., 21 mA; and 12 ft. (dry side), negligible.

(3) The pole and crossarm were then uniformly wetted artificially. A strip-brass earthing collar 1½ in. wide was tightly clamped around the pole at 8 ft. from ground level and con-

nected to the earth connection of the pole by .0225 sq. in. copper wire.

(4) After ten minutes the contact pad (with 4,000 ohms resistor in circuit) was applied *below the earthing collar*, with the following results, pole surface being 30 per cent. dry in longitudinal patches: 2 ft., 13 mA; 4 ft., 31 mA; 6 ft., 48 mA; and 7 ft., 51 mA.

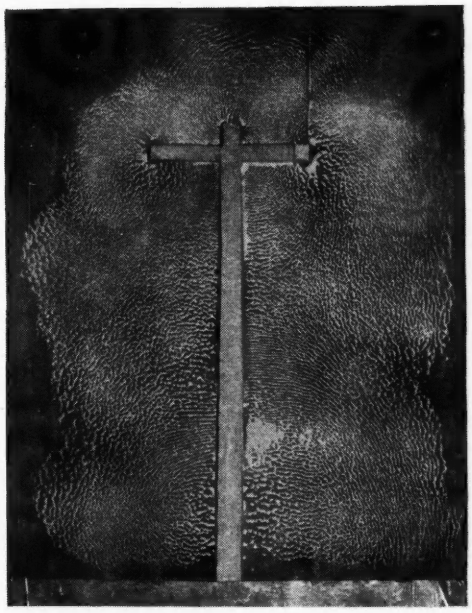
(5) After thirty minutes the above was repeated, with the following results, the pole surface being 50 per cent. dry: 2 ft., 33 mA; 4 ft., 90 mA; 4.5 ft., 112 mA (lamps bright); and 6 ft., 140 mA (lamps bright).

The above tests, in which a current to earth of up to 140 mA was obtained from below a plain earthing collar, demonstrate the uselessness of such collars as a safety device (15 mA may give a fatal shock to a normal man if the heart is in circuit).

(6) Currents to earth through the earthing lead attached to the collar were measured and were found to be of the order of 5 to 10 mA only. A 4-in. wire nail driven radially into the pole through the earthing collar at once brought the current in the earthing lead up to 300 mA. With a total of eight such nails the current rose to 425 mA.

(7) With these eight nails through the earthing collar, the contact pad with the 4,000-ohm resistor in circuit was again applied, when the following currents to earth were obtained: 2 ft., 2 mA; 4 ft., 7 mA; and 6 ft., 11 mA.

As stated, the whole of the above current tests were made at 11 kV to earth. Under the more familiar condition of 6.35 kV to earth, proportionately smaller currents would, of course, have been recorded.



Lycopodium dust figure illustrating shielding effect of energised half of crossarm

Destruction Test

About 10 min. after the artificial wetting of the pole, smoke appeared from the crossarm near the insulator pin. Longitudinal shakes opened up in the crossarm and showed signs of carbonising. After about 20 min. smoke appeared from these shakes, the source of the smoke moving steadily towards the pole. After 30 min. smoke appeared from the pole-top, and tracking, with small intermittent flames, at the earthing collar. Heavy smoke and flames appeared at the pole-top after 75 min., and after 85 min. the test was stopped, it being clear that the complete destruction of the structure was inevitable.

The input to the pole was measured immediately before switching off. It was found to be 5.06 kVA, implying a resistance of 24,000 ohms. This low resistance was evidently due to the carbonising of the crossarm and pole and to the short-circuiting of 8 ft. of the pole by the earthing collar and its earth-lead.

Subsequent observations of the pole and crossarm (which were cut up for this purpose) revealed that in the crossarm there appeared to have been a uniform distribution of current over the cross-section, as indicated by uniform carbonisation, except in the neighbourhood of shakes and except also for a superficial layer of about ¼ in. in thickness. The latter was probably saved from carbonisation by the comparative ease with which it would dissipate heat. In the pole, however, there was a sharply defined, central, carbonised core, roughly 1½ in. diameter at crossarm level, and tapering off to nothing about 6 ft. farther down. The extension of this core downwards would, no doubt, have accelerated the final stages of destruction of the pole.

Conclusions

From the foregoing tests it may reasonably be inferred that: (a) complete failure of primary insulation on 11-kV "unearthed" construction is likely to cause rapid destruction of the pole and crossarm under the "Petersen coil" condition of 11 kV to earth; (b) under such conditions dangerous or even fatal shocks are obtainable from the pole within easy reach of ground level; (c) plain earthing collars of the type employed are worse than useless on account of their spurious appearance of safety. To be made even partially effective they need to be associated with means for obtaining liberal and intimate contact with and across the pole section to which they are applied.

The results of the tests must not be interpreted in terms of the wetness or dryness of the test pole. The presence or absence of visible superficial moisture on a pole is no kind of a guide as to its average moisture content; also a pole which was wet when primary insulation first failed would probably become increasingly dry thereafter so far as average moisture content is concerned, irrespective of the atmospheric conditions.

Despite unpleasant possibilities revealed by these tests, it should be remembered that thousands of miles of unearthed and unbonded wood-pole lines are, and have been for many years, in successful operation abroad and that they are not associated with any record of shocks even though pole fires are far from unknown. The shock risk, indeed, must be low, probably because dangerous conditions are realised only by a combination of circumstances each of which is comparatively rare. Thus there must be an insulator failure (and insulator failures are less frequent with unearthed construction); this failure must be of a kind which admits of direct contact between conductor and the supporting ironwork or crossarm; the pole, perhaps, must contain a considerable amount of occluded moisture; a man or animal must come into contact with that particular pole, and effective, not tentative, contact must be made between it and earth.

It has been pointed out that if the insulator failure were of the common kind which preserves a short porcelain surface between the conductor and the insulator pin the whole of the phenomena developed in the writer's experiments would fail. The experiments themselves gave some strong indication of this: in one case (not detailed above) voltage and current phenomena from that part of the test pole within reach from ground level failed almost completely when a crossarm, which had previously been stored for some weeks in a dry, indoor situation was first employed.

This probably explains the extraordinary degree of supplemental insulation provided by the pole in very dry climates, of which there is considerable evidence, but it also conveys a warning not to expect corresponding results in the damp climate of the British Isles. Nevertheless, it has been suggested in a responsible quarter that much can be done to eliminate any risks associated in general practice with unearthed lines if a suitable type of stirrup binder is used. This kind of binder, by tending to hold together the fragments of a shattered insulator head, helps to preserve some degree of porcelain insulation between the conductor and the insulator pin, and thus tends to suppress dangerous conditions at their source.

Any remaining hazards are materially lessened by the reduced incidence of the prime cause, namely, insulator failure, and in the practical issue may perhaps be fairly set against the greater risk associated with normal earthed construction of conductors burning through and lying, fully charged, on the ground or along hedgerows.

In conclusion I would express acknowledgments to Mr. G. H. Perkins for his energetic collaboration throughout these tests, for the execution of which he was largely responsible, and to the Pirelli-General Cable Works, Ltd., for the assistance which they afforded.

Electrical Service Radio Station

PRELIMINARY tests of a new 250-W special emergency radio station (KWIG) to be used by Kansas City Power & Light Co. to speed service restoration in time of emergency are being made. The transmitter, operating on 39,660 kc/s, will be located on the 31st floor of the company's building and will be equipped for remote control from the system-operating and trouble departments. Ten cars and trucks have been equipped for two-way operation at present, with more to come if preliminary tests prove effective.

The radio installation is an attempt on the part of the company to save some of the valuable time lost during emergencies by line crews in locating telephones on which to report findings and get new orders. With the new two-way radio equipment it will be possible for crews to report and get new orders before leaving the scene of the emergency.—*Electrical World.*

INSTITUTION PROCEEDINGS

Advantages of H.R.C. Cartridge Fuses. Performance of Toughened-glass Insulators. Engineering Standards. Instruments for Recording Voltage Surges

High-rupturing-capacity Fuses

CARTRIDGE fuses filled with inert or endothermic substances as now made with large rupturing capacities were the subject of a paper by Mr. J. W. Gibson (General Electric Co., Ltd.) which was presented at the Institution of Electrical Engineers in London on April 11th. Typical three-phase values were 25 MVA at 440 V and 300 MVA at 33 kV. The semi-enclosed rewirable porcelain type was not usually suitable for conditions corresponding to more than 3 MVA, three-phase.

In summarising the advantages responsible for their rapidly increasing use, mention was made of the extremely high cost of development testing in comparison with the price of the article. Enumeration of the B.S.S. 88-1939 requirements indicated that the test conditions were logically related to the circuits in which the fuses were to be used. The author showed how different was the relation between the test conditions and the severity of the test. He also explained the difference between the interrupting action of circuit-breakers and cartridge fuses. Whereas the former's function was to prevent re-establishment of AC arcing after momentary current-zero extinction, the cartridge filling absorbed and cooled metallic vapour from the arc. The resulting hot column set up stable and consistent arc voltage (perhaps 1,000 V per inch, or more) that had a current-reducing effect, which could be visualised as the sudden introduction of steadily increasing high resistance. Action and performance were similar with AC and DC, in contradistinction to other types of circuit-breaking apparatus, which had a much lower DC capacity.

Reduction of the cross-section of the element was possible in a number of ways and combinations thereof; the smaller it was the easier would be the duty of the fuse, since the arc would contain less metallic vapour to be cooled. This was an invariable and cardinal point in design, while a smaller section of element also enabled short-circuit fusing to take place more quickly before the full prospective current of the circuit was reached. Thus pre-arcing (melting) time was short and the current at which arcing commenced was small, while the energy to be subsequently dealt with was reduced. Such easement of duty was equivalent to an increase of capacity. Oscillographic investigations of the process of fusing emphasised the factors determining current limitation, enabling conclusions to be drawn, both analytically and from the tests, regarding the effect of circuit conditions on the duty imposed, in comparison with B.S.S. 88 requirements.

It was impossible to lay down any definite rule for the relation between AC and DC breaking capacities which would take into full account the several variables involved. The author therefore did not consider it practicable to formulate proving tests for either AC or DC alone in the case of fuses intended to be used for both systems. Following a short reference to choice of materials, available types of fuse for low, medium and high voltage circuits were briefly described, the paper concluding with some notes on their applications.

Glass Insulators

TWO papers concerned with glass insulators were submitted to the Transmission Section of the Institution of Electrical Engineers in London on April 10th. The shorter one, entitled "The Development of a Pre-stressed ('Toughened') Glass Insulator," by Mr. P. M. Hogg (Pilkington Brothers, Ltd.) briefly described the composition and manufacture of glass, followed by an explanation of the way in which strains were imposed internally during cooling from the viscous liquid to the elastic state.

The strains, said the author, could be measured in transparent glass with the aid of polarised light by means of an optical system of the Babinet compensator type, because the velocity (and therefore refractive index) depended on the average distance between the atom groups, which varied with the strain. Their final magnitudes depended upon transient temperature distribution; their permanency upon the rate of cooling, co-efficient of expansion, and the ratio between thermal conductivity and specific heat per unit volume. The resulting stresses, proportional to the corresponding strains, could be controlled by adjustment of the rate of cooling and almost entirely removed by subsequent annealing in a lehr (tunnel) along which an appropriate temperature gradient was maintained.

Commercial annealing usually allowed a slight permanent compressive strain to remain in the surface layers of the glass, so increasing its resistance to mechanical load and thermal shock. Toughened glass was rendered still more resistant by so treating it after manufacture as intentionally to produce such a strain distribution as would cause the surface layers to be in a state of high compression while the interior was in a state of tension.

Such pre-stressing was brought about by elevating the glass to a uniform temperature considerably above its strain temperature and then cooling it rapidly, usually by blowing air on all its surfaces under carefully controlled conditions. This process was limited to comparatively simple shapes in which satisfactory strain distribution could be obtained. It enabled load to be increased four or five times before compression was converted to tension, causing fracture, since the breaking load might be regarded as a measure of the weakness of the surface rather than of the strength of the glass.

Power line insulators made of this kind of glass were composed of one-piece pressings (a number of separate pressings cemented together forming the larger pin-types) equalised in a furnace with a rotating hearth and cooled by compressed air. They were claimed to be not puncturable in air by voltage surges, while ageing by slow cracking could not develop in the compressed surface. Any toughened-glass insulator which was visibly whole must be sound, since mechanical breakage or electrical puncture resulted in complete shattering due to the release of the potential energy stored in the strained glass. This paper concluded with brief references to development tests, some being still in progress.

Comparisons with Porcelain

The second and longer paper was an official communication from the Electrical Research Association (report ref.: U/T16) summarising five separate investigations and indicating the relative behaviours of porcelain and glass insulators under controlled test conditions.

Power arc flashover tests by Messrs. A. E. Helden and C. E. R. Bruce (without mechanical stress, which in practice might amount to several tons on tension strings) showed that when the arc path was controlled the insulators always broke at the point of application of the arc, whereas with an uncontrolled arc rupture usually occurred on the side opposite to the arc's original position, due to movement thereto of the arc in the hot gas below the insulator, as a result of the mutual repulsion between the two portions of the arc above and below the insulator.

Rupture was usually caused by heating of the underside, the probability of its occurrence being greatly increased if the arc remained fixed to one point on the insulator pin. The minimum completely controlled current and the average duration to cause rupture of toughened glass were greater than for porcelain, probably twice as great. Pyrex insulators, which an earlier investigation showed to offer much more resistance to fracture by an arc than the other glass and porcelain insulators then available, might be somewhat less satisfactory in this respect than those of toughened glass. The damage was less in the case of the toughened glass than of porcelain, the corrugated under-surface of some of the latter survivals being practically levelled off by the arc. The porcelain broke during or immediately after the application of the arc, while the glass broke at intervals of from a few seconds to 27 hours after the cessation of arcing. When toughened glass units failed, the shed shattered completely, whereas four porcelain units and two Pyrex units cracked, but remained apparently intact, so that a faulty insulator might remain undetected after arcing.

Possible fracture due to mechanical stresses set up by radiant heat from the sun was investigated by Mr. A. M. Thomas, Miss M. V. Griffith, and Dr. S. Whitehead, who also examined stone-throwing hazards.

Surface deposits caused equal surface temperatures, and differences in temperature gradients were not large. If allowance were made for contamination there was no ground for suggesting any alteration of the 70 deg. C. test temperature specified in B.S.S. 137. If kept clean, glass would not be subject to thermal stresses to the same extent as brown porcelain; white porcelain experienced a rise of temperature slightly less than glass, due to high reflective power together with relatively high conductance.

More incident radiation was absorbed through some glazes than others. The low temperature rise of Pyrex glass was

due to low absorption. From the thermal point of view there was no appreciable difference between bottle glass and toughened glass insulators, with or without copper-sheathed tops. Impact tests indicated the relative security of insulators against stone throwing, but under uncontrolled conditions nothing very definite could be said about relative resistances. If smooth stones only were thrown toughened glass was much more resistant to impact shock than any other type, but the resultant damage suffered by the majority of porcelain insulators was much less.

As an aid to the estimation of the possibility of puncture due to surges, impulse tests were made by Messrs. A. H. Davis and W. J. Standring in the high-voltage laboratory at the National Physical Laboratory. They showed the electric strength of porcelain to be about 500 kV per cm. for a five microsecond wave and about 20 per cent. lower for a 100 microsecond wave. For annealed glass the figure was 2,200 kV per cm., and for toughened and Pyrex glass it was 1,700 kV per cm. Pyrex appeared to be very susceptible to surface flaws in manufacture, of the nature of sharp-bottomed grooves, at which puncture occurred. Some of the grooves were visible, but not detectable by the finger nail. Many porcelain samples also had surface depressions or excrescences, which reduced their electric strength, but could be rendered satisfactory by grinding with 120 carborundum powder and water.

Performance trials in humid and polluted atmospheres under service conditions were made by Mr. J. S. Forrest at the C.E.B. testing station at Croydon. At the maximum working voltage to earth (85 kV) counter records of leakage-current surges exceeding 20 mA showed that the superiority of cleaned insulators was only maintained for a few months. The performance of glass was slightly superior to corresponding porcelain, but it was not suggested that this difference was significant because it did not appear to be possible to eliminate a certain fortuitous element from such measurements.

Recording Voltage Surges

THE continuous recording by means of klydonographs of voltage surges primarily due to lightning on overhead lines, of the Central Electricity Board and the Yorkshire Electric Power Co., was dealt with in a paper by Mr. J. L. Chandler which was read before the Meter and Instrument Section of the Institution of Electrical Engineers in London on April 5th.

The paper was based on an E.R.A. report (ref. S/T 26) and was mainly concerned with the improvements that have been made (about three years ago) to the instruments employed and their auxiliaries. The first section contained a general account of the investigations, which had been in progress for six years. The second section described how instrumental defects had been overcome. The third made specific reference to unit-type potential dividers. The fourth dealt with calibration and how it was performed in the E.R.A. laboratory, the voltage limits and probable accuracy of recording being stated.

The measurement of klydonograph figures was both difficult and subject to individual judgment, the author said. There did not appear to be any justification for closer limits than ±0.5 mm. It was doubtful whether further development time and labour could be justified; 50-cycle calibration could not be satisfactorily employed for impulse voltage estimation, but it did afford ready means of predicting the response to impulses very approximately. The instruments in their present form were capable of recording with reasonable accuracy surge voltages between 3 and 15 kV, but it was doubtful whether this range could be enlarged without using wider films and larger electrodes and clearances.

The fifth and sixth sections of the paper contained a chronological resumé of the field tests, an analysis of the results and conclusions drawn, mainly relating to the great care needing to be exercised in the construction and use of the instruments.

The number of records made during thunderstorms was insufficient to permit generalisation on the nature of lightning surges on transmission lines. Tentatively it might be said that the majority did not exceed three times the normal voltage and had no harmful effect on the line or on the apparatus connected thereto. Since, however, damage due to lightning surges did occur, the figure given must not be regarded as approaching the upper voltage limit, which was governed mainly by the insulation of the line. The results to date did not indicate a preponderance of either positive or negative surges, but the majority were unidirectional, although they might undergo reversal by reflection. It was not uncommon for a thunderstorm to occur near a line without producing any appreciable surge voltages on it.

Switching surges were numerous. They were usually unidirectional (or oscillatory but highly damped), approximately equally divided between the two polarities, and limited to not more than twice normal voltage.

Objects of the B.S.I.

THE significance of the work of the British Standards Institution was discussed by Mr. Percy Good (deputy director) in a paper to the London Branch of the Association of Mining Electrical Engineers on April 2nd.

Mr. Good paid tribute to the foresight of British engineers who had laid the foundations of a movement which had spread to all industries and into practically every country, establishing it in this country on a truly democratic basis of self-government, *i.e.*, by a particular industry as a whole for that industry, but with due regard to its effect on other industries. It behoved us to see that that position was not lost through the power of any one group, whether it was represented by a professional association, trade combine, organisation or Government Department.

Insistence on agreement between the interests concerned before a standard was promulgated had resulted, on the whole, in a wide acceptance of it. If all reformers would realise the wisdom behind that kind of procedure greater progress would be their reward. The original committee had grown to be a chartered institution with more than 1,000 industrial and technical committees. Pressure for more standards was continuous. The fundamental principles which governed its operation were simply (1) to prepare a standard only when those concerned with the production and use of the product or material in question agreed that a standard was desirable; and (2) to issue a standard only if those chiefly concerned agreed that a suitable draft had been produced.

Although not quite first in the field the electrical section of the B.S.I. had got off the starting line perhaps more rapidly than other sections and had been the largest individual section ever since. The mining industry, of all sections of industry, was probably subjected to the closest statutory technical regulation and control and it was a tribute to the responsible B.S.I. committees and to the sagacity of the officials of the Mines Department that the Government had, wherever possible, preferred to regulate by reference to British Standard Specifications, which were arrived at by agreement between users and makers, and appropriate departmental technical experts.

Domestic Plug and Socket Chaos

Mr. Good said he was almost ashamed to speak of the domestic plug and socket, yet chaos produced by individualism was not worse than an overdose of regimentation. The problem of earthing had not quite been resolved and there had been an excuse for the past diversity; but was it not time now to settle the question and to refuse all but British Standard plugs and sockets?

The Council had offered the services of the Institution to H.M. Government a few months before the outbreak of war. Considerable work, especially relating to wartime needs, had resulted in the issue of a special series of specifications prepared for the Ministry of Home Security (A.R.P. Department).

The B.S.I. owned certification marks as well as proprietary rights to the term "British Standard." Some important conclusions or principles had been reached which had been endorsed by all the constituent parts of the British Commonwealth, and had received some support in the U.S.A., where so far a different view had been taken. Those principles were under discussion with the European countries before the outbreak of war. It was desired to secure that certification marks, *i.e.*, of quality or performance, to indicate conformity to a specification, should be granted only to a recognised independent organisation and not to any organisation financially interested in the products it was desirous of marking. More important still, perhaps, was the conclusion that such marks should be used only under effective control. The B.S.I. considered it essential that any proving scheme should be on the basis of proving that the material conformed to a written specification, and should not be on the basis of whether or not the testing authority considered the material to be satisfactory.

The B.S.I. felt that its present system had considerable possibilities and was proving quite successful. That system required a maker, who was desirous of marking his goods with the B.S.I. certification mark, to maintain in operation a system of control during the process of production which would give assurance that the product always conformed to the specification. There were other safeguards and the scheme would be found to add practically nothing to the cost of production.

The present time was opportune for a full survey in each branch of industry. Wartime, with its restrictions, its price

control, &c., provided the opportunity for eliminating those things which accumulated and hung round an industry as a millstone. Everyone concerned with production should look into his own and his industry's ranges and ask the B.S.I. to assist in the inquiry."

In reply to Mr. W. C. Barry (past branch president) Mr. Good said that technical proposals were referred to a committee which was expected to be rather commercially minded to ensure that the technical people's enthusiasm did not run away with them. In a number of cases the representatives of a country had agreed to the acceptance of a proposal internationally, but had said they could not change their national standard, and each country reserved that freedom. But British industry, to its great credit, when it had expressed agreement with some variation of its own proposals, had generally been able to persuade the people at home to accept it.

Mr. C. Le Maistre (director of the B.S.I.), replying to a question concerning the publication of specifications in languages other than English, said that a good deal of translation was being done into other languages.

Mr. J. A. B. Horsley (past president of the Association) felt sure that the more widely the registered mark system was adopted and applied to mining electrical plant the better it would be for the users of that plant. Indeed, he could see no alternative to the voluntary adoption as widely as possible of the British Standard mark as an indication that apparatus complied with the standards laid down in a British Standard Specification. Of course, in giving a manufacturer the right to use the mark on the basis of his possession of an adequate testing and checking organisation, one would be relying on his honesty; and it was tribute to the general honesty of British manufacturers that the British Standards Institution, with expert advice, had come to the conclusion that permission to use the mark on those grounds was infinitely preferable to any system of testing a number of promiscuous samples.

The Mines Department, he added, in collaboration with the Mining Institutes and the Cable Makers' Association, had effected recently the elimination of unnecessary sizes and descriptions of flexible cables used in mines.

Correspondence

Every letter must be accompanied by the writer's name and address preferably, but not necessarily, for publication. The Editors cannot accept responsibility for correspondents' opinions

Chief Engineers' Salaries

YOUR correspondent who signs himself "Anti-Humbug" would, I suggest, have been wiser had he got hold of the true facts before rushing into print. May I, therefore, be permitted to give him a few facts and also put to him the following points:—

(1) Is he aware that any member of the Associations to which he refers who accepts a banned job is expelled from the Association concerned?

(2) He appears to think that the Associations prepare the advertisements for municipal vacancies for chief electrical engineers in which previous municipal experience is asked for. Comment on this point, is obviously unnecessary.

(3) Companies being free agents as regards their appointments are out to get the best men for the job. May I ask how many companies he can name who consider previous experience of the supply industry of so little importance that they have appointed as chief engineers, the men he refers to, who have had no experience on the supply side of the industry and have been employed by electrical contractors, consultants, etc.?

(4) Is he of the opinion that the position of lower paid men in other branches of the industry will be improved by men from those branches taking positions as chief engineers in supply undertakings at absurdly low salaries?

(5) What does he consider would happen in the case of:

(a) A doctor who accepted a position as medical officer of health or medical officer at a public institution at a salary below the scale approved by the British Medical Association.

(b) A workman who went to a factory and offered to work at sixpence per hour below the trade union rate even if he (the workman) was capable of doing the work equally as well as other men employed in the factory.

Again, I suggest, comment is unnecessary.

I would only add in conclusion, that in my opinion, your correspondent could appropriately have slightly abbreviated the nom-de-plume he selected. ALFRED J. C. DE RENZI.

Newcastle, Staffs., *April 8th.*

Prices and Grouses

I have been interested to read the complaints in regard to increases in the prices charged by the various supply companies. There seems to be an entire absence of consistency or justification in some instances. I think one of the most scandalous cases is my own and, curiously enough, one of the companies concerned is just that one which formed the basis of a question asked in the House of Commons a short time back; I refer to the Notting Hill Electric Lighting Co.

My house is situated in the district served by this company and I have been a consumer for a considerable period. At first the charges were, to my mind, a little bit on the high side, but as I was one of the manufacturers of plant supplied to the original station, out of a spirit of loyalty I did not complain. As time went on the company voluntarily reduced its charges to such a low level that my last quarter's account, which for a private dwelling was fairly high, brought the average price out at 0.6d. per kWh. It is now proposed to increase the price to the extent that it will probably bring the average price up to 0.9d. per kWh, but this figure is, in my opinion, sufficiently favourable to preclude any cause for "grousing."

Now contrast this with the charges which have to be sustained by my company at its works and offices. Unfortunately, we have to obtain our supply from the Central London Electricity, Ltd. (formerly the Westminster Electric Supply Corporation). This company's original works I also assisted in equipping and probably this may be the cause of the treatment under which my company has to suffer! This seems to me to be the only reason for what I have to state.

We have a fairly large day lighting load and, of course, use power for driving machinery and also for welding. The rates hitherto have been high enough in all conscience, but it is now decided to increase the rates by more than 50 per cent. so that the average rate will come out at 4d. per kWh, as compared with the 0.9d. per kWh paid by me at my house. The only satisfaction I can obtain from this company in answer to my protests amounts to practically this: under their powers they are entitled to charge these amounts and they intend to do so, and that's that.

If, as they state, the supply of electric power is a necessity and must be paid for and the supply company is entitled to charge as much as will make up its income to the desired amount, then why not allow suppliers of foodstuffs to charge whatever they please so that when trade is bad or customers for one reason or another leave the district, they should be able to put up the price of the commodities so that they will make the same amount of profit. There appears to me to be no more or less justice in the one case than the other.

London, S.W.1, *April 9th.* EDWARD L. JOSEPH.

Neon Sign Contracts

Mr. Hollis invites me to reply to his letter appearing in your April 5th issue and I am accordingly doing so. I propose, however, being very brief and to pass directly to the two numbered questions which Mr. Hollis puts to me, despite the fact that I disagree heartily with certain prior points made by Mr. Hollis. Speaking of the hire-maintenance agreement, Mr. Hollis makes this statement:—

> "The document evidencing the transaction does not contain the true agreement between the parties, because there is without question an understanding that, in the end, the sign shall remain in the hands of the user and not be retaken as it would in a true simple bailment contract."

The statement is simply without any basis whatsoever in fact, at least insofar as my own company is concerned. This statement on my part forms, of course, a complete reply to Mr. Hollis's two questions. To be entirely clear, however, I add that no tacit arrangements are or ever have been made by my company agreeing to vary the vital terms of our hire-maintenance agreement; as stated in the agreement, the installation is always the property of the manufacturers. Upon the completion of the first term of such an agreement we almost invariably (pre-war of course) negotiated, without difficulty, a renewal contract at a substantially lower annual rental with our customer. When we failed to do so, however, we dismantled and recovered the installation concerned.

S. D. MOYSE,
Chairman, The Master Sign Makers' Association (Electrical Section), Director and General Manager, Claude-General Neon Lights, Ltd.

London, W.C.2, *April 9th.*

LOAD BUILDING IN WARTIME

E.D.A. Sales Management Conference

An Outline of Policy

PROBLÆMS arising from the wartime conditions provided the main topics of discussion at the two-day Electricity Supply Sales Management Conference held by the British Electrical Development Association at the Connaught Rooms, Great Queen Street, Kingsway, London, on Wednesday and Thursday. The question of policy was the first to be reviewed and in his paper on the subject Mr. John C. Dalton, manager and secretary of the County of London Electric Supply Co., Ltd., declared that it was becoming clearer every day that the industry of the country was as much one of the fighting services as were the armed forces and that the electricity supply industry on account of its efficiency and resources, was one of the most powerful of the industrial services.

Their service was essential to munitions and war production generally. They were able to electrify over 200 farm implements and so increase the nation's food supplies, and they were able to assist other industries dealing with vital export trades. There could be no argument about this and he did not think there should be any argument about the industry carrying out its proper functions in the electrification of domestic premises during the war. He could not see that this would be doing anything contrary to the interest of the State; in fact, it would be strengthening the basis on which the war was being fought.

The necessity for a cheap and sufficient supply service was not arguable. Several undertakings, particularly those in South-East England, had found it necessary to increase their tariffs. These increases had been made despite the Government dictum that prices must be kept down and that if they were not might be regulated. They had been made, too, in the light of the fact that the Electricity Commissioners required justification for any increases. Those undertakings which had found it necessary to increase their prices could, however, he thought, in every case justify their action. The prejudice of an increase of price was therefore the first of the new problems facing many salesmen and it was their duty to make themselves acquainted in detail with the incidence of the increased price on the use of any apparatus and to be able to show, apart from convenience and cleanliness, that the new price could be compared favourably with other uses where increased prices had also been introduced. They should also be able to explain the necessity for any increase.

Study of Tariffs

Those undertakings which had to increase their prices should see to it that the increases interfered with the "promotional" tariffs as little as possible and should make it their aim to get back to the lower tariffs as soon as circumstances allowed. Incidentally, the war had caused a lull in new business and had given them time to think about their tariffs and to wonder whether they were really as ideal as they had formerly imagined. The multiplicity of tariffs still remaining was a sign that many of them were wrong and he would welcome the resurrection of the committee formed some years ago to report to the Electricity Commissioners on tariffs generally.

With regard to the question of the continuance or otherwise of hire and hire-purchase of apparatus, they had seen their sales grow correspondingly to the assistance they were able to give consumers in the matter of finance. If they were to continue, as they must, to sell their commodity, they must also continue with some sort of assistance to consumers in the way of hire or hire-purchase.

Most undertakings would have already felt the strain which military exigencies had imposed on their development, showroom and canvassing staffs. The burden of carrying on must fall on the older members and the numbers must be made up by engaging more female staff or boys not old enough to be called up. There thus arose the need for some sort of quickened training for these new employees. The showrooms must obviously still remain the principal "sermonising" influence of their undertakings and despite the somewhat panicky measures taken in the early days of the war it was obvious that there was still a good case for the properly equipped showroom and demonstrations. The depletion of the sales staffs appeared to dictate the need for the continuance of publicity and propaganda as far as it was possible.

Mr. Dalton contended that most of his arguments in respect of the need for "carrying on" could be nullified if service and maintenance were not continued.

He concluded by saying that the main reason for his views on sales management policy in wartime was an economic one. Such was the structure of the industry—with its alarming proportion of overhead charges—that unless it went on it would go down. That simple fact, in relation to a vital national industry, could not have been recognised when the Treasury issued its embargo on further expenditure and development. He thought that it was now being recognised in the interpretation which has been circulated regarding the embargo.

Importance of the Domestic Load

SPEAKING of further problems of sales managers in wartime, Mr. J. B. Ashworth, consumers' engineer, Blackburn Electricity Department, said that the electrical industry was at the present crisis of its affairs charged with a grave responsibility. It must face not only the necessity for making every sacrifice essential to the country's need, but also the equally vital necessity of devising some means for marking time without losing ground and without sacrificing the machinery that had made possible its ordered progress during the past decade. The importance of the electricity supply industry in the economic life of the country could be estimated from the fact that it gave direct employment to about 103,000 workers with an annual wages bill of nearly £16,000,000 and indirect employment to approximately 40,000 workers, which was one in sixty of all workers in insurable employment. It employed a total capital of over £608,000,000 with an annual revenue amounting to £91,000,000.

In considering their attitude towards the gas industry they must remember that any stand-still pact between the two industries must react very much to the advantage of gas, since the gas interests would be well content to consolidate their present position by renewal of long-term agreements which would have the effect of cutting out electricity for the next ten years.

The first few weeks of the war hit most severely the sales side of the industry and there was a danger that unless some immediate steps were taken the progress and goodwill built up over many strenuous years would be irretrievably lost. The three main contributory factors affecting the reduction of sales were the curtailment of hire and hire-purchase facilities, the restriction of capital expenditure, and the Fuel and Lighting Order. Undertakings withdrew hire and hire-purchase facilities mainly because they interpreted the Treasury letter as meaning that no more capital would be available for financing schemes for domestic appliances. There could be no doubt that the extent of wartime sales activities would depend on the amount of loan sanction that could be obtained for financing hire-purchase schemes. This stricture applied only to municipal undertakings who favoured, for the most part, hiring schemes; it did not directly affect the company undertakings which raised their own capital. Circumstances might make it expedient for municipal undertakings to consider the reintroduction of hire-purchase as a corollary to their hiring schemes, as these facilities could be supported to a certain extent out of revenue.

In principle the restriction of capital was quite justified, but, in his opinion, the restrictions should be applied only to non-revenue producing capital. The development of the domestic load was an important factor in the economy of electricity supply undertakings. The capital invested in domestic appliances on hire was not only secured by the consumer, but had the effect of reducing overhead charges by increasing the revenue available from existing consumers who had already been provided with electricity services.

Hire and Hire-purchase

Approximately 65 per cent. of the undertakings in the North-West Area had maintained hire facilities and 32 per cent. their hire-purchase schemes following the declaration of war. In a number of cases, however, the continuation of hire was limited to the exhaustion of existing stocks and reconditioned apparatus. In general, hire-purchasing business had been considerably modified; deposits had been increased and the hire-purchase period considerably reduced. In some undertakings, hire-purchase was limited to those over military age or in reserved occupations. Having regard to all the difficulties in the way of carrying on hire and hire-purchase business, he believed that the sales staffs of undertakings in most areas were capable of maintaining between 50 and 60 per cent. of pre-war business under present conditions. Moreover, it must be remembered that to most areas the war had brought a form of temporary prosperity to large sections of the community and

their domestic needs would have to be catered for, even in wartime.

Since the war began they had been constantly urged to conserve the nation's resources and avoid waste. The replacement of obsolete equipment and the extensive use of electrical appliances for cooking and water heating with their higher efficiency and adaptability would result in tremendous saving of raw fuel, since it would obviate the need for fires during the whole of the day, particularly in summer time.

One of the difficulties encountered in arranging window displays in wartime was the restricted window space available after complying with black-out regulations. One way of partly overcoming the difficulty was to concentrate more on interior displays. In organising wartime demonstrations, special regard had to be paid to the conditions created by the war. The national emergency had provided many opportunities for both helping the needs of the country and keeping the benefits of electricity in the public mind. The war had provided a new function for advertising, and, though it was probably undesirable to use the Press for ordinary boosting of sales or for making blatant announcements with reference to rationing, it could be used with effect to maintain contact with the public and safeguard the goodwill of the industry.

The effect of the war on installation work had been to increase activity in the industrial field. Domestic installations had decreased, but not to the extent anticipated, and a firm sales policy was rapidly retrieving the position. In determining future policy it should not be forgotten that sales staffs had been instrumental in building up the prosperity of the industry at a cost of something less than 0.2 per cent. of revenue. There was no real reason why sales staff should be dispersed and there were many fields of activity, even in wartime, where they could be usefully employed.

Consumers' Complaints

THE paper by Mr. G. E. Barrett, commercial manager, the Northmet Power Co., read yesterday morning, took the form of notes describing a system instituted by his company at the beginning of 1937 for recording and investigating the complaints received from consumers. All complaints, he said, whatever the nature and from any source, and irrespective as to how they were received, as, for example, by letter, telephone, callers, &c., were included in the scheme. Each local office and showroom was provided with a "Complaints Book" and once weekly they reported the position to head office on a special form. Local undertakings took the necessary action to rectify any mistakes made, gave the consumer an explanation, and, if at fault, made an apology for the error or lapse in service. They merely reported the facts to head office, which was responsible for deciding whether the company was at fault and, of course, undertook the general supervision of the scheme.

The system had now been in force for approximately three years and worked very well. Statistical analyses prepared indicated not only where the responsibility lay, but also constituted a comparison between undertakings. A review of the cases where the company was considered to be at fault indicated that the merchandising section of the business was responsible for just over half (56 per cent.) of the mistakes made. The human element entered into merchandising more than the rather routine and straightforward supply section, and consumers often made unreasonable demands on the former service.

Experience gained showed that it could not be too strongly emphasised that when a consumer placed an order for wiring, appliances or repairs, he should be advised when it was anticipated that the work would be commenced and completed. If the consumer was not satisfied, he had at that time the option of taking his work elsewhere and might, of course, find that the service offered by the supply undertaking could not be improved upon. Delay in the replacement of parts for out-of-date appliances was often the cause of dissatisfaction, though this delay was usually beyond the control of the supply undertaking. Complaints regarding faulty installations and appliances were an indication of slackness on the part of the staff concerned, and it should be obvious that before handing over installations or appliances, careful testing and inspection were essential. The difficult class of consumer was always to be found, but courtesy was essential to any business.

Small Proportion

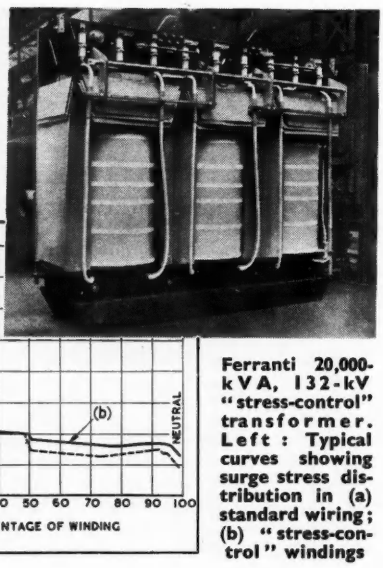
Co-operation with two firms manufacturing and selling vacuum cleaners enabled the supply undertaking to keep a closer watch on the interests of consumers than would be the case if the vacuum-cleaner salesmen were operating independently. Mistakes in invoices and accounts were rather irritating to consumers, though they formed only a very small percentage of the total billings. Nevertheless, any system of billing should endeavour to prevent the possibility of a consumer receiving a demand in respect of an account for which payment had already been made. During the three-year period over three million meter readings were taken, and it was something of an achievement that only 77 cases of incorrect readings were recorded. Similarly, although the average number of meters out on circuit was about 300,000, there were only 32 cases of faulty instruments. With regard to voltage regulation, it was becoming increasingly difficult in the urban areas to secure suitable sub-station sites, so that although in the majority of cases requirements could be anticipated, it was not always possible to take the appropriate action as early as could be desired.

There was a remarkable consistency between the number of mistakes made each week per 10,000 consumers for areas similar in character but under different administration, and that, together with the low record of mistakes, indicated that there was a limit beyond which one could not hope to achieve improvement.

The programme for yesterday afternoon included an address by Mr. R. W. Harris, assistant secretary, Ministry of Food, on the "National 'Right Food' Campaign."

Transformer Lightning Protection

DAMAGE to transformer windings due to high-voltage surges on transmission lines through lightning and other disturbances is in general caused by local concentrations of stress. Reinforcement of the insulation at points known from experience to be relatively weak is frequently ineffective, and consequent failures have occurred in the adjacent ordinary insulation. A new "stress-control" design by Ferranti, Ltd., Hollinwood, Lancs, takes the essential requirement as not necessarily uniform voltage distribution, but uniform voltage gradients or stresses; *i.e.*, it is held that equality of voltages between turns and coils throughout the winding is immaterial so long as the insulation is in proportion and is appropriately increased where the maximum voltages are relatively high.



Ferranti 20,000-kVA, 132-kV "stress-control" transformer. Left: Typical curves showing surge stress distribution in (a) standard wiring; (b) "stress-control" windings

Voltage distribution is largely determined by the insulation between turns and coils, and this insulation determines the electrical strength. By co-ordinating these values the surge coil and turn voltages while not necessarily uniform throughout the winding can be proportioned to the insulation strength at every point, resulting in substantially uniform stresses. Thus the insulation actually providing the electrical strength is used as a convenient means of controlling the corresponding electrical stresses.

The comparative quantitative results shown in the accompanying curves are taken from cathode-ray oscillograph measurements on a 5,000-kVA three-phase, 33-kV transformer with a 0.2/40 microsecond incident impulse. The general construction of transformers of this design follows the usual practice and mechanical and thermal characteristics are unchanged. An increase in lightning strength of two to five times normal is claimed for little extra cost. Surge tests to destruction have been carried out on such transformers varying in capacity and voltage from 25 kVA at 11 kV to 60,000 kVA at 132 kV.

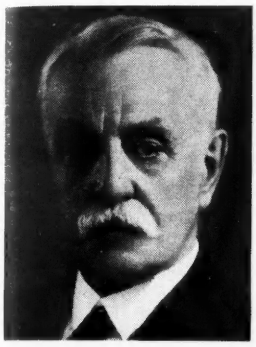
PERSONAL AND SOCIAL

Information regarding new appointments and other matters of interest for this page are welcomed

SEVERAL Ministerial changes were announced last week. **Mr. W. S. Morrison** becomes Postmaster-General in succession to **Major G. C. Tryon,** who has been appointed Chancellor of the Duchy of Lancaster and has been raised to the peerage. The new Secretary of the Department of Overseas Trade is **Mr. G. H. Shakespeare** in the place of **Mr. R. S. Hudson** who has become Minister of Shipping.

Walsall Electricity Committee reports that **Mr. W. Buckley,** testing engineer, having resigned to take up an appointment with the Luton Corporation **Mr. E. A. Thomas,** service engineer, has been promoted to fill the vacancy. **Mr. L. Dyson,** of Dukinfield, has been appointed service engineer.

The Committee of the Association of "Old Cromptonians" has announced that **Sir James Swinburne,** Bt., F.R.S., has consented to fill the office of president rendered vacant by the death of the late Col. R. E. Crompton, R.E., C.B. Sir James Swinburne was technical manager of Crompton & Co., Ltd., from 1885 to 1889. He became a member of the I.E.E. in 1885 and is a past-president of the Institution. He is also a member of the Institution of Civil Engineers.



Sir James Swinburne, Bt.

The Committee also announces that its annual dinner will take place in London on May 31st, and asks that all members who through war-time exigencies have not been advised directly should get in touch with the hon. secretary Mr. H. H. Spencer, Bush House, W.C.2 (tel.: Temple Bar 5911).

Mr. E. Guthrie Jones, of the Metropolitan-Vickers Electrical Co., Ltd., has been nominated as chairman of the North-Western Students' Section of the I.E.E. for the session 1940-41.

Mr. M. J. Pattison has resigned his position as director and London manager of the E.M.B. Co., Ltd., but retains an active interest in the transport and traction products of that company for this country (excluding Scotland and the North-East coast) and abroad. The new arrangement leaves him free to handle other manufacturers' products. His address remains as previously at 503-4, Cecil Chambers, 86, Strand, London, W.C.2 (tel.: Temple Bar 9000).

Mr. J. E. Nelson, M.I.E.E., chief engineer of the Mersey Power Co., was elected chairman of the Mersey and North Wales (Liverpool) Centre of the Institution of Electrical Engineers at the annual meeting of the Centre held on April 1st, and Messrs. E. G. Taylor, B.Sc. (Eng), and H. Pryce-Jones, M.Eng., were elected vice-chairmen.

At the request of the Town Council, **Mr. R. N. Torpy,** borough electrical engineer of Tunbridge Wells, has agreed to carry on for the duration of the war. He had previously asked to be allowed to retire, having completed forty years' in the service of the Corporation.

Mr. Marshall Churton, North of England and Scottish representative of Crypton Equipment, Ltd., has been granted a commission in the Royal Army Ordnance Corps.

Mr. Frank Pick, vice-chairman of the London Passenger Transport Board, is retiring on May 1st after having been in railway service for thirty-eight years. Mr. Pick was educated at St. Peter's School, York, and qualified as a solicitor in 1902. In the following year he took the LL.B. (London) degree with first-class honours. He joined the railway service under Mr. George Gibb on the old North Eastern Railway in 1902, and four years later came to London with him to join the Underground Group. He was transferred to serve under Lord Ashfield, and continued with him as managing director to the Underground Group until its transfer to the L.P.T.B. Mr. Pick is a member of the London and Home Counties Traffic Advisory Committee.

Mr. Frank Pick

Mr. J. Lightbown who, as we announced in our last issue, is to succeed **Mr. S. Cameron Gibson** as borough electrical engineer of Nuneaton, was educated at Queen Elizabeth School, Blackburn, and at Blackburn Technical College and Salford Royal Technical College. He was a premium pupil under Mr. P. P. Wheelwright, borough electrical engineer at Blackburn, and then served for some years in various junior capacities with the Blackburn Corporation Electricity Department.

From May, 1931, to May, 1934, he was with the Salford City Electricity Department as an assistant mains engineer, and left there to take up the position of technical mains assistant with the Cheltenham Corporation, with whom he remained until March, 1937, when he joined the Nuneaton Corporation Electricity Department as principal technical assistant and chief assistant. He was subsequently promoted to the position of deputy borough electrical engineer, in which capacity he will continue until he succeeds Mr. Gibson as borough electrical engineer on May 24th. Mr. Gibson, although retiring from his present position, will continue to act as consulting engineer to the Corporation for a period of twelve months. Mr. Lightbown's salary will be subject to revision at the end of two years in the light of the proposed new scale which is to take the place of the Walker scale.

Mr. E. F. Westwood, whose appointment as borough electrical engineer of Morecambe and Heysham we recently announced, joined the Barrow Corporation Electricity Department as junior assistant, and subsequently held in succession the appointments of charge engineer and mains assistant. He left Barrow to take up his present position as senior technical assistant with the Mid-Southern Utility Co. Mr. Westwood is a Bachelor of Engineering (first-class honours), and Master of Engineering, University of Liverpool.

Mr. E. F. Westwood

Mr. J. S. Baigent, of the Heckmondwike Electricity Department, has been presented by his colleagues with a travelling case, on leaving to take up an appointment at Portland.

Mr. S. A. Cresswell, representative in the South Midlands and portion of the West of England, for Falk, Stadelmann & Co., Ltd., retired on March 31st after many years' service. He joined the company in 1915.

Mr. J. Leadbeater was married on March 25th at St. Mary's Church, Eastbourne, to Miss Kathleen Finney, of Rugby. Mr. Leadbeater is with the Associated Portland Cement Manufacturers, Ltd., at Greenhithe, and he is the nephew of Mr. James Leadbeater, late borough electrical engineer of Hampstead.

I.M.E.A. Council Nominations.—As we have already reported, Mr. B. Handley (Portsmouth) has been nominated for the presidency of the Incorporated Municipal Electrical Association for 1940-41. Other nominations made by the Council are as follows. Vice-president, Mr. J. W. J. Townley (West Ham). Ordinary members of Council: Group A: Ald. J. A. Beck (Mansfield), Councillor J. Selwyn Jones (Newton-le-Willows) and Mr. W. P. Lilwall (Fleetwood). Group B: Ald. A. Sturgess (Derby), Major G. C. Milnes (Lancaster) and Mr. J. P. Spark (Willesden). Group C: Ald. Sir Percival Bower (Birmingham), Mr. H. C. Lamb (Manchester) and Mr. F. H. Whysall (Belfast).

Mr. F. S. Naylor, chief electrical engineer of Thos. Firth & John Brown, Ltd., has been appointed borough electrical engineer of Southwark. He served his apprenticeship with the British Thomson-Houston Co., Ltd., Rugby, and received his engineering training at the City and Guilds (Engineering) College, the Imperial College, South Kensington, where he obtained the qualifications of A.C.G.I. and B.Sc. (Engineering). After a period of power station testing, he joined Imperial Chemical Industries, Bellingham, where he was concerned with the design and construction of the I.C.I. power station. His next post was technical assistant with the West Midlands J.E.A., with whom he was engaged on the specification, design and construction of Ironbridge power station and the Shropshire distribution area.

In December, 1935, Mr. Naylor was appointed technical assistant to the general manager of Sheffield Corporation Electricity Department in which post he was responsible for the co-ordination of generation and distribution, for the main h.v. switchgear, design and layout, all Central Electricity Board matters and the specification and purchase of practically the whole of the electrical equipment required by Sheffield. While at Sheffield he was offered his present position of chief electrical engineer to Firth-Browns, which has one of the largest steelworks electric furnace installations in Europe, having

an electricity consumption of over 100 million kWh a year. Mr. Naylor was elected chairman of the Sheffield Sub-Centre of the I.E.E. for 1939-40.

Mr. E. W. Spalding, A.M.I.Mech.E., has been appointed general sales manager of Ruston & Hornsby Ltd. Mr. Spalding is a native of Cambridge and was apprenticed to the company, then Ruston Proctor & Co., Ltd., from 1897 to 1903. After attending the Municipal School of Technology, Manchester, he rejoined the company in 1904, and from 1905 onwards he visited many parts of the world on its behalf. During the last war he held a commission in the Royal Garrison Artillery and was awarded the Military Cross. In 1932 he was appointed manager of the Overseas Sales Department, an appointment which he has held until his recent promotion.

Mr. H. J. Smith, M.I.E.E., district manager of the Bedfordshire, Cambridgeshire and Huntingdonshire Electricity Co., since its inauguration in 1925 retired at the end of last year. At the Electricity Offices, St. Neots, on April 4th, Mr. A. Anderson, managing director, supported by Mr. B. G. Drummond, general manager, presented Mr. Smith with an inscribed gold wristlet watch, cheque and a booklet containing the names of all the contributors, on behalf of the staff of the company.

The Faraday Medal (Eighteenth Award) will be presented to **Dr. Alexander Russell,** F.R.S., at the ordinary meeting of the I.E.E. to be held on April 25th. The presentation will precede the thirty-first Kelvin Lecture, to be delivered by **Dr. C. G. Darwin,** M.C., F.R.S., on "Thermodynamics and the Coldest Temperatures."

Mr. F. S. Coates, district engineer at Alnwick for the North Eastern Electric Supply Co., Ltd., has been appointed district manager of the Yorkshire Electric Power Co. He takes up his new appointment in Leeds on May 1st.

Obituary

Mr. W. B. Woodhouse.—The funeral of Mr. W. B. Woodhouse took place at Bramhope Parish Church on April 3rd, about 500 employees of the Yorkshire Electric Power Co., and associated companies lining the main street leading to the church. Following the service cremation took place at Lawnswood, Leeds. In addition to the family mourners, the following directors of the Yorkshire Electric Power Co. and associated companies were present: Sir R. Geoffrey Ellis, M.P. (chairman, Y.E.P. Co.), Mr. R. W. Wickham (chairman, Electrical Distribution of Yorkshire, Ltd.), Mr. A. H. Meysey-Thompson, Col. H. C. Fraser, and Mr. W. A. Crowther.

A member of the staff of the Yorkshire Electric Power Co. writes *inter alia*: "The career of Mr. W. B. Woodhouse gave an indication, by the very number and distinction of the offices he held, of his remarkable qualities. The position he held demanded an intimate acquaintance with the whole range of technical problems connected with the industry, a wide knowledge of the major manufacturing industries of the country, and of economic and political problems. In all these Mr. Woodhouse was at ease. There was hardly a branch of the industry in which he had not made a notable and lasting contribution. Those who had the privilege of enjoying his more intimate friendship admired the wealth of his knowledge of many subjects, of men and affairs, and his power of conversation. He was a perfect host, and his charm of manner made an unforgettable impression."

The late Mr. E. W. Green

Mr. E. W. Green.—We regret to announce the death on April 6th of Mr. Edward William Green who in recent years had been in charge of the development of "Tufnol" bearings (Ellison Insulations, Ltd.). Mr. Green, who was forty years of age, joined the drawing office staff of the parent company, George Ellison, Ltd., in 1920, and was transferred in 1924 to the switchgear sales department. In 1935 he was appointed chief estimator of Ellison Insulations, Ltd., and later took control of the development of "Tufnol" bearings.

Joint Organisation at Blackburn

Electrical Opposition

MEMBERS of Blackburn Town Council indulged in some straight criticism on April 4th during a three hours' debate on a resolution by Councillor R. F. Mottershead, Council leader, for the amalgamation of the existing sales organisation and showrooms of the Gas and Electricity Departments, the introduction of joint reading of gas and electricity meters, and the adoption of a system of continuous billing.

The resolution, which was approved by 27 votes to 12, proposed to set up a standing committee to control the joint sales organisation, the precise functions and personnel of which would be settled by a committee consisting of the chairman and vice-chairman of the Gas, Electricity and Finance Committees, and of the Gas and Electricity Joint Sales Committee. Various ledgers and meter readers, collectors and rental clerks in the Gas and Electricity Departments would be transferred to the control and supervision of the borough treasurer so that joint meter reading and continuous billing might be introduced as early as practicable.

Councillor Mottershead said that the scheme had a 100 per cent. support of the borough treasurer and the good wishes of the gas engineer, but he must face complete opposition from the electrical engineer. He visualised the appointment of a new and first-class official with a good knowledge of electricity and gas sales who would be on the status of a chief official. This official's task would be to co-ordinate sales and he would take over the existing organisations with their technical men. Probably he would eventually operate from one showroom but would continue to allow two separate sides to develop simultaneously through their own activities.

Dealing with a report of the electrical engineer (Mr. R. H. Harral) he objected to the opening sentence "that joint meter reading appeared to the man in the street as very desirable, but investigation and experience had proved conclusively that the present practice of keeping control under the management of the departments concerned was one which could not be improved upon on the ground of economy, efficiency and service to the consumer." How could it be proved conclusively when the borough treasurer did not agree? The Corporation had over £1,000,000 invested in the Gas Department and by the end of 1941 the estimated deficiency would be £40,000. When sinking charges and interest fell in it was estimated that the profit would be between £6,000 and £10,000. Even so it would be several years before the deficiency could be cleared.

The financial changes would not be introduced until the chairman of the Finance Committee and the borough treasurer were satisfied the time was opportune. There was no intention to disband the Gas and Electricity Committees. They would function as works committees and the new official would co-operate with the gas and electrical engineers.

Councillor Tempest, seconding, said the cost of running two separate showrooms for the departments was considerable and a great drain upon their resources.

Councillor Johnson (chairman of the Gas Committee) suggested an amendment incorporating the opening paragraph of the scheme with this addition: "These are issues requiring most careful consideration before being put into operation and without committing the Council to their adoption at this stage, the scheme be referred to a special committee for investigation and report."

Councillor W. E. Woolley said that while he supported a scheme of joint meter reading he disagreed with the methods adopted in bringing the question forward. It was the policy of the mailed fist to force the matter through. He opposed a joint sales organisation, which was impracticable.

Councillor W. Hare refuted the idea that the action taken was unconstitutional. It was obviously no good sending the matter to the Electricity Department, who would condemn it "out of hand."

On this point the Town Clerk stated that this was the first time the Council had been asked to approve a matter in principle before the pros and cons had been considered in committee.

Alderman C. A. Critchley (chairman of the Electricity Committee) said Councillor Mottershead could have put his plans before the last two meetings of the Electricity Committee of which he was a member "but he had not the courtesy to do so. He is utilising his majority on the Council to carry this matter through." He complained that the Conservative caucus "took advantage of discussing this subject" while he (Alderman Critchley) was away and without having even heard him as chairman on the subject. He was so concerned about the issue that he communicated with the Electricity Commissioners. The reply expressed some concern at the terms of the scheme. The plans, the alderman added, would be detrimental to the Electricity Department and would not help the Gas Department one iota.

The Mayor (Councillor E. Porter), for several years vice-chairman of the Electricity Committee, said whether the resolution went through or not would make no difference to the Act of Parliament governing electrical affairs. He complained that none of the chief officials had been asked to submit a report on these proposals.

The amendment to refer the question to a special committee for investigation was defeated.

COMMERCIAL and INDUSTRIAL NEWS

Contract Prices. Australian Import Restrictions. E.A.W. Conference. Balkan Trade Scheme. Export Groups. Industrial Area Organisation

Contract Price Variations

IN connection with the Model Form of General Conditions A—Home, with erection—(revised 1938) issued by the Institution of Electrical Engineers, the following additional clause was approved by the Council of the Institution on March 28th for use during the war.

"If by reason of any rise or fall in the cost of material, labour or transport or of conforming to such Acts, Orders, Regulations, and By-laws as are first referred to in Clause 34 (Statutory or other Regulations) above or below such costs ruling at the date of the tender the cost to the contractor of performing his obligations under the contract shall be increased or reduced, the amount of such increase or reduction shall be added to or deducted from the contract price as the case may be provided that no account shall be taken of any amount by which any cost incurred by the contractor has been increased by the default or negligence of the contractor."

Automatically Operated Pumps

Water for the hot and cold strip mills of John Summers, Ltd., Shotton, is now obtained from five new deep-well pumping stations about four miles from the works and 1¼ miles from one another. The pumps are driven by 150-HP, 440-V motors, equipped with rotor and stator starting panels, and deliver to a 65,000-gal. reservoir with a rise and fall of 30 ft. A float-operated switch disconnects the 440-V supply at high-water level and a second float operates a Midworth water-level transmitter connected to a recording dial and two relays on the main panel at a central control point. The relays are provided with dials marked in feet and a variable setting device causing the motors to be started when a predetermined low-water level is reached. One relay closes contacts on "auto 1" position, the other on "auto 2" position, the latter functioning if the pumps controlled by auto 1 are not providing sufficient water; manual control is also available.

A fourteen-core p.i.l.c. double steel-tape armoured 0.003 sq. in. cable is employed. DC is supplied *via* a rectifier to six pilots, one to each site and a common return. DC high-resistance pull-in coils on the motor starters close contactor relays but do not allow enough current to flow to energise the warning lamps and aural alarms until two trips have occurred when the coils are short-circuited. Two pilot cores are used for telephones between the mill and the control point and the remaining six to transmit current proportionate to the current taken by each power-transformer primary.

Power supply at 11 kV is taken to a ring-main isolating and two-way distribution unit from which duplicate cables are run to another ring-main unit at the control point and fed to T.A.P. oil-fuse circuit-breakers, each of which is directly connected to an 11,000/440-V, 150-kVA transformer at a pumping site. Mr. A. G. Cutts, electrical engineer to the mill, designed the h.v. distribution system. Crompton Parkinson, Ltd., and the British Electric Transformer Co., Ltd., were responsible for the supervisory control scheme. The former also provided the motors and multi-core cable, and the latter the transformers. Brookhirst Switchgear, Ltd., and Evershed & Vignoles, Ltd., acted as sub-contractors.

Wages in the Supply Industry

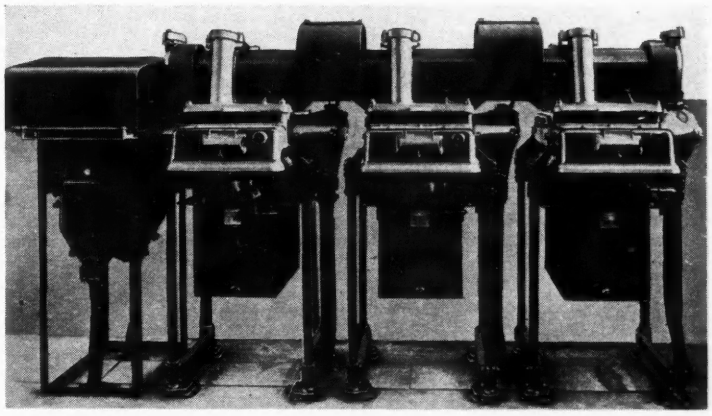
The National Joint Industrial Council for the Electricity Supply Industry has decided to increase the present war bonus from ¾d. to 1¼d. per hour, with proportional increases for apprentices, probationers and juniors. The new rate is to remain in force for three months; it came into operation from the commencement of the first full-pay period following April 4th.

Iron and Steel Control

The Minister of Supply has made the Control of Iron and Steel (No. 8) Order (S.R. & O. 1940, No. 496) which came into force on April 8th superseding the Control of Iron and Steel (No. 6) Order made on January 29th. Under the provisions hitherto in force certain classes of purchasers were exempted from the licence requirement when purchasing steel for specified purposes, but in future, for the products included within the new distribution scheme, this exemption will be limited to purchases covered by a symbol and contract or reference number the use of which is authorised by the appropriate Department. Although the Order came into force on April 8th the operation of the Direction in connection with this scheme is postponed in the case of future orders for steel products covered by the scheme until April 29th, and, in the case of old orders for such products, until May 31st, so as to give time for the allotment through the various channels of the symbols, contract or reference numbers and delivery periods. Attention is called to the fact that under the new direction all licences for steel products covered by the scheme heretofore issued to stockholding merchants are revoked. These should, therefore, be returned forthwith to the Iron and Steel Control. Arrangements have been made for the immediate replacement of these licences by new licences. All other existing licences remain in operation subject to the provisions of the new distribution scheme.

Chrome, Magnesite and Wolfram

The Minister of Supply has made the Control of Chrome, Magnesite and Wolfram (No. 1) Order. Under the Order the sale and purchase of these materials, wherever situated, will be regulated by a licensing scheme, but a direction issued at the same time under the Order exempts from the licensing provisions everything except chrome ore and concentrates, magnesite costing less than £25 per ton delivered at consumers' works, and wolfram. Mr. N. Isaacs, of the Ferro-Alloys Section of the Iron and Steel Control, will act as adviser to the new Control on wolfram. The Order comes into force on April 15th except as regards wolfram, for which it came into force on April 8th, on which date wolfram was removed from the ambit of the Iron and Steel Orders by the Iron and Steel (No. 8) Order. Inquiries in regard to wolfram should be addressed to the Iron and Steel Control, Steel House, Tothill Street, London, S.W.1, and for other products to the Chrome Ore, Magnesite and Wolfram Control, Broadway Court, S.W.1.



A 4-panel e.h.v. Crompton Parkinson switchboard of the type supplied to John Summers, Ltd.

Australian Import Restrictions

As from April 1st the Australian Government has imposed further restrictions upon imports from non-sterling countries. These do not apply to any British Empire country except Canada, Newfoundland and Hong Kong. The new list includes the following classes of goods:—50 per cent. restriction: Filament lamps for lighting and heating (except those under 6 V), radio receiving valves, and vacuum cleaners (other than electrically operated outside bag types, the f.o.b. value of which is £4 10s. sterling or less). Total restriction: Electric shavers (not including replacement parts), high-tension ignition coils and electric motors for household washing machines. Electric warning devices for road vehicles are to be subject to total restriction from July 1st.

Electric Vehicle Exhibition at Cardiff

The South Wales Electric Vehicle Exhibition, at Cardiff, which we dealt with in our last week's issue, was opened informally on April 3rd. The exhibition attracted a number of visitors within an hour of opening, and the roomy showrooms, with large plate-glass windows on both sides, displayed the exhibits to the best advantage. The show was supervised by Mr. J. Steele, assistant secretary of the Electric Vehicle Association, and Mr. E. J. Dowson, Area Officer of the British Electrical Development Association, with the co-operation of others. The Lord Mayor of Cardiff (Ald. H. J. Johns) visited the exhibition on the Thursday, and among others who attended were the following municipal electrical engineers: Mr. E. Jones (Cardiff), Mr. A. Nichols Moore (Newport), Mr. H. E. Blackiston (Swansea), Mr. J. Trevor Jones (Gellygaer), and Mr. Ben Jones (Bedwellty). Altogether there were ten exhibitors, whose displays attracted a

great deal of attention during the two days from prominent Cardiff business men and a number of interested commercial concerns from various parts of South Wales. Mr. E. J. Dowson stated that this exhibition was one of a series which were being held in different centres throughout the country. One had already been held at Birmingham and another at Manchester, and the Association intended to hold future exhibitions at Leeds (May 1st and 2nd), Hull, Glasgow (May 13th-15th), and a second one at Manchester.

E.A.W. Conference

Despite the war a large attendance is expected at the 15th annual conference of the Electrical Association for Women which this year is being confined to one day, next Thursday, April 18th. After the annual general meeting, at the Institution of Electrical Engineers, at 10.15 a.m., the Director, Miss Caroline Haslett, will give an address on "The E.A.W. and its Work in Wartime." Realising the increasing importance of the nation's food and the special interest it has for every housewife, the association is focusing attention on this subject at the annual luncheon which follows at the Park Lane Hotel. A lead will be given by the Minister of Food, Lord Woolton, speaking on the importance of the home-maker, while Dr. Edith Summerskill, M.P., will consider how electricity can raise the status of those who perform home duties and can give leisure for the carrying out of work of national importance. Mr. J. C. Dalton, manager and secretary of the County of London Electric Supply Co., Ltd., will also speak, and the luncheon will be presided over by the Dowager Lady Swaythling, president of the Association. In the afternoon members are invited to inspect the newly planned kitchen at the E.A.W. headquarters, 20, Regent Street, S.W.1.

Machine Tools

In view of the great expansion in the manufacture of machine tools for the production of armaments, it has been considered advisable by the Institutions of Mechanical Engineers and of Production Engineers to make available at once the results of the work already carried out by the Research Department of the latter body. "Acceptance Test Charts for Machine Tools" (available at 5s. 6d., post free, from either Institution) covers six types of first-grade machines, viz.: Centre lathes (up to 16 in. swing), knee-type horizontal and universal milling machines, horizontal slab or surface milling machines, plain and universal grinders and radial drills. Single charts may be obtained at 6d. each. Test data are given on two or more fold-in sheets in each case. Preceding these are fifteen pages of introductory matter, including a historical survey, general instructions and notes on the application of tests on measuring tools and methods employed, &c.

Trade with the Balkans

Plans for the development of trade between Britain and Balkan countries are in hand, and the Government has formed a special trading company, called the English Commercial Corporation, whose capital will be subscribed by the Treasury. Lord Swinton is chairman of the new company and the directors include Mr. A. Chester Beatty, who is *inter alia* a director of the Northern Rhodesian Power Corporation, and Mr. C. P. Lister, chairman and managing director of R. A. Lister & Co., and chairman of Blackstone & Co. It is intended to establish trade relations in Balkan countries on a permanent basis, and to ensure supplies, especially of manufactured goods, to those countries from Britain, as well as any requirements from the British Empire.

Modern Factory Lighting

Earlier in the year the Better Light Committee of E.D.A. circulated to approximately 23,000 factory executives throughout the country a copy of "Modern Factory Lighting." The Committee has now issued a summary of the results of this campaign as far as they can be appreciated at this comparatively early stage. It must be realised that, in view of possible difficulties in handling inquiries, the Better Light Committee decided to circulate the book without providing for the usual follow-up work, and specific inquiries were therefore not invited. In spite of that, 1,500 letters were received, couched for the most part in appreciative terms. Many were from Government bodies and leading national organisations.

Export Groups

The *Board of Trade Journal* for April 4th contains particulars of twenty-six Export Groups set up under the auspices of the Export Council. We have already mentioned the B.E.A.M.A. Electrical Machinery Export Committee (chairman, Mr. V. Watlington; secretary, Mr. A. G. Seaman, 36, Kingsway, W.C.2) and the Internal Combustion Engine War Export Group (chairman, Sir Lynden Macassey; secretary, Mr. Herbert Cowper, 32, Victoria St., S.W.1). The list also includes the Telephone & Telegraph Apparatus Export Group (chairman, Sir Alexander Roger; secretary, Mr. T. F. Lee, Connaught House, Aldwych, W.C.2), and the Compressed Air Machinery Export Group (chairman, Mr. C. W. Crawshaw; secretary, Mr. E. Lacy-Hulbert, Boreas Works, Beddington, Croydon). In addition to those given there is the Electrical Apparatus Export Committee (chairman, Mr. C. Rodgers, O.B.E.; secretary, Mr. Felix Rogers, 36, Kingsway, W.C.2).

The Radio Manufacturers' Association has recently been responsible for the organisation of a Radio Export Group, information regarding which can be obtained from the R.M.A. Secretary, Mr. R. P. Browne, 59, Russell Square, W.C.1.

Industrial Area Organisations

The Ministry of Supply announces the inauguration of Area Advisory Committees for London, Stafford, Bedford and Ipswich consisting of nominees of the Engineering and Allied Employers' Federation and the engineering trade unions. Among the members of the London Committee are Mr. J. J. C. Bacon (Edison Swan Electric Co., Ltd.), and Mr. N. V. Kipping (Standard Telephones & Cables, Ltd.). The personnel of the Stafford committee includes Brig.-Gen. A. C. Baylay, D.S.O. (chairman, Birmingham, Wolverhampton and Stafford District of the Federation), Mr. W. E. Clark (English Electric Co., Ltd.), Mr. G. B. Sankey (J. Sankey & Sons, Ltd.) and Mr. W. Lewis (Electrical Trades Union). The Bedford committee includes Mr. R. S. Allen (W. H. Allen, Sons & Co., Ltd.), Mr. L. K. Flemming (Igranic Electric Co., Ltd.), Mr. C. C. Mason, O.B.E. (Cambridge Instrument Co., Ltd.), Mr. C. B. Unwin (Kryn & Lahy (1928), Ltd.), Commander P. W. Kent (George Kent. Ltd.) and Mr. G. A. R. Mead (Skefko Ball Bearing Co., Ltd.). Among the members of the Ipswich committee are Mr. F. Ayton (Ransomes, Sims & Jefferies, Ltd.), Mr. A. Leggett (E. R. and F. Turner, Ltd.), Mr. P. A. Sanders (Davey, Paxman & Co., Ltd.), and Mr. T. W. Cooper (Hoffman Manufacturing Co., Ltd.).

The Stockton Area Committee, which covers the southern part of County Durham and the northern part of Yorkshire, states that it is in possession of information regarding the munitions work being done by contractors and sub-contractors but it believes that there are a number of smaller firms in the area possessing the necessary plant and labour which could undertake some of the work which is required. Such firms are asked to communicate with the Secretary of the Northern Area Board, c/o Ministry of Supply, Collingwood Buildings, Collingwood St., Newcastle-upon-Tyne, 1. An exhibition of certain items required has been arranged at St. Nicholas Buildings, Newcastle. These can be inspected upon application to the Area Officer, Collingwood Buildings.

Quarries and Mines

The annual reports of H.M. Inspectors of Mines and Quarries for 1938 have just been issued in an abbreviated form (Stationery Office, 4d.). As from July 1st, 1938, all quarries and metalliferous mines came under legislation specifically relating to their operation and not under the Factory Regulations. The latter, however, still hold good for manufacturing processes carried on in premises adjacent to and belonging to the quarry or mine.

In and outside the quarries 67 persons were killed; 6,608 were disabled for more than three days, of whom 303 suffered serious injury. There were no fatal accidents due to electricity, and of the five non-fatal accidents only two caused disablement for more than three days. Fatalities above and below ground in metalliferous mines totalled 14, and again none was due to electricity. In only one instance of the 1,316 persons injured (42 seriously) was electricity involved, and that was on the surface of the mine.

Exhibition of Munitions Samples

The Ministry of Supply announces that the Exhibition of Munition Samples, London and South-Eastern Area, has been moved from Savoy Hill House to 111, Penfold Street, Paddington. Applications for permits to view this exhibition should be made to the Area Officer, London and South-Eastern Area, Ministry of Supply, whose present address is Savoy Hill House, London, W.C.2 (telephone: Temple Bar 1221, Ex. 128).

American Electrical Exports

The United States Department of Commerce reports that exports of electrical equipment during January were valued at $10,815,382. Although this was lower than in December last, it represented an advance of over 44 per cent. upon the total for January, 1939. Among the items which registered gains as compared with December were AC generators ($289,000); stationary motors (1 to 200 HP) ($234,000); stationary motors over 200 HP ($133,000); motor starting and controlling equipment ($216,000); and welding sets, motor-generator type ($137,000). Shipments of transformers at $458,000, and domestic refrigerators at $456,000 were lower than in December.

Refrigerator Sales in America

Owing to the favourable reception of the new low-priced refrigerators introduced by most manufacturers in January hopes have been encouraged that sales of all refrigerators will exceed 2,000,000 units this year, against 1,870,000 in 1939, says *Reuter's Trade Service* from New York. In anticipation of greater demand from consumers, dealers ordered more heavily in January than in any month on record, with orders for 234,662 units or 53 per cent. more than in the same 1939 month, and 35 per cent. more than in January, 1937, the previous record year. The price of the 6-cu. ft. refrigerator was reduced on an average by $30 by most producers. Vigorous selling campaigns planned for the next few weeks in preparation for the spring buying season are expected to stimulate sales, and trade circles hope for a larger replacement demand.

Trade Announcement

Associated Contracts, Ltd., has removed to Victoria House, Vernon Place, Southampton Row, London, W.C.1. The telephone number and telegraphic address remain unchanged.

Trade with Spain

The Board of Trade Journal of April 4th gives details of the Anglo-Spanish Trade Agreement which was signed in Madrid on March 18th. In this connection it is of interest to learn of the formation of the Anglo-Hispano Trading Co., Ltd., 131, Baker Street, W.1, for the purpose of promoting trade between the two countries. The directors are Sir John Pratt, J.P., Ald. W. Egerton Martin, J.P., Mr. A. S. Sinnatt, and Mr. J. P. Rolfs. The company informs us that it has had already inquiries for tramway motors and equipment, fractional h.p. motors and electric furnaces.

To secure the benefit of the minimum tariff certain goods must be accompanied by a certificate of origin upon importation into Spain. The classes affected include cables of aluminium wire, whether or not with part of other metals; telegraphic and telephonic apparatus and their detached and component parts; incandescent electric lamps; and radio receiving valves.

Garcke's Manual

The 1939-40 edition of "Garcke's Manual of Electrical Undertakings and Directory of Officials," is the forty-second annual volume of this work, which has become an indispensable book of reference to all engaged in the electricity supply industry. It contains financial, technical, commercial and general information relating to nearly 3,000 electricity undertakings, including the Dominions and British Possessions, and includes directories of electrical contractors in the United Kingdom (arranged under towns, &c.), and of directors and officials (alphabetically arranged). The buyers' guide, which includes practically all the leading manufacturers and contractors, is arranged in a classified form for the convenience of those requiring quotations. A number of maps of electricity supply areas and one of London traffic areas are included. As in the case of previous volumes, the whole of the data is derived from official sources, and has been verified at the latest possible time by the undertakings concerned. The Manual is published by the Electrical Press, Ltd., at 37s. 6d. net.

Prices of Materials

The following prices are only general, and they may vary according to quantities and other circumstances:—

CHEMICALS, ETC.	Price April 10th	Fortnight's inc. or dec.
a Acid oxalic ... ... per cwt.	Suspended	—
a Ammoniac, Sal ... ... per ton		—
a Ammonia, Muriate (large crystal)... ,,		—
a Borax... ... ... ,,		—
a Copper, Sulphate ... ... ,,		—
a Potash Chlorate ... ... per lb.		—
a ,, Perchlorate ... ... ,,		—
a Shellac ... ... per cwt.		—
a Sulphur, Commercial ... ... per ton		—
a ,, Roll ... ... ,,		—
a Soda, Chlorate ... ... per lb.		—
a ,, Crystals ... ... per ton		—
a Sodium Bichromate, casks ... per lb.		—
METALS, ETC.		
b Aluminium, Ingots ... ... per ton	£110	—
b ,, Wire ... ... per lb.	1/3 to 1/9	—
b ,, Sheet and Foil ... ,,	1/6 to 2/9	—
p Babbits Metal and Anti-friction Metals—		
Grade I ... ... per ton net	£197	—
Grade II ... ... ,,	£137	—
Grade III ... ... ,,	£73	—
c Brass (rolled metal 2" to 12" basis)... per lb.	9¼d.	—
c ,, Tubes (solid drawn) ... ... ,,	1/1½ to 1/1¾	—
c ,, Wire, basis ... ... ,,	10¼d.	—
c Copper Tubes (solid drawn) ... ,,	1/2¾	—
g ,, Bars (best selected) ... per ton	£95	—
g ,, Sheet... ... ... ,,		
g ,, Rod ... ... ,,	£62	—
d ,, (Electrolytic) Bars ... ... ,,	£65.10s.	—
d ,, ,, Wire Rods ... ,,	9⅝d.	—
d ,, ,, H.C. Wire ... per lb.	£26.10s.	—
f Ebonite Rod ¼" dia. & up ... ... ,,	1/10to2/3 + 20%	—
f ,, Sheet ⅛" thick & up ... ,,	1/4 to 1/8 adv.	—
n German Silver Wire, Nos. 1 to 12... ,,	2/5	—
h Gutta-percha, fine ... ... ,,	Nom.	—
h India-rubber, Para fine ... ... ,,	1/0¾	—
g Lead, English Pig ... ... ,,	£26.10s.	—
g Mercury ... ... per bot.	£51 8s. 6d.	—
e Mica (in original cases) small ... per lb.	1/3 to 3/-	—
e ,, ,, ,, medium ... ,,	9/- to 18/-	—
e ,, ,, ,, large ... ,,	20/- to 27/6	—
p Phosphor Bronze, plain castings ... ,,	1/2½	—
p ,, ,, drawn bars & rods ,,	1 3½	—
p ,, ,, rolled strip & sheet ,,	1/1½	—
p ,, ,, wire ... ... ,,	1/3½	—
o Platinum ... ... per oz.	£9.10s.	—
d Silicium Bronze Wire ... ... per lb.	8¾d.	—
g Spelter ... ... per ton	£25.15s..	—
g Tin, Block (English) ... ... ,,	£251	£3 15s. inc.
n ,, Wire, Nos. 1 to 16 ... ... per lb.	4/9	—

Quotations supplied by:—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India Rubber, Gutta Percha and Telegraph Works, Co., Ltd.
g Henry Gardner & Co., Ltd.
h Edward Till & Co.
n P. Ormiston & Sons.
o Johnson Matthey & Co.
p C. Clifford & Sons, Ltd.

The above table is published here fortnightly. In alternate issues, in which it does not appear, the latest prices of copper, silicium bronze wire, lead, rubber, tin and spelter, up to the time of going to press, are given in this section under the same heading.

I.E.E. Mersey and North Wales (Liverpool) Centre

The annual dance, organised by the Mersey and North Wales (Liverpool) Centre in aid of the Benevolent Fund of the Institution of Electrical Engineers, which was postponed last October, was held on March 29th, at Reece's Restaurant, Liverpool. Over 170 members and their friends were present, including many from Manchester and other centres. During the evening a portable wireless set, given by an anonymous donor for the benefit of the Fund, was raffled by Mr. O. C. Waygood, and an amusing diversion was the distribution to the lady guests taking part in the "grand parade" of a large number of prizes which had been collected by Mr. Morland from members of the committee. It was due to the indefatigable efforts of the hon. dance secretary, Mr. E. G. Taylor, and the organising committee, that the guests spent an enjoyable evening and it is hoped that as a result of the dance, with its "sideshows" the Benevolent Fund will benefit by about £90.

Winding-up Petitions

In the Companies' Court on April 8th Mr. Justice Crossman had again before him the petition for the compulsory winding-up of Asbestos Molybdenum Tungsten Co., Ltd.

Counsel said the petition was opposed and he asked that the petition should stand over for a week in order that an application could be made for the fixing of a day for the hearing as the case was a long one.

His Lordship assented and the hearing was accordingly adjourned until April 15th for a day to be fixed for the hearing.

A petition for the compulsory winding-up of Architectural Constructional and Electrical Utilities, Ltd., also came up for hearing again.

Counsel for the company said they desired a little time and it had been agreed that the petition should stand over for a week. The company opposed the petition and they alleged that instead of their being indebted to the petitioner there was a debt due to them from him.

His Lordship directed that the petition should stand over until April 15th.

L.E.P. Savings Group

The formation of a savings group in March met with an immediate and substantial response from the staff of the Lancashire Electric Power Co. The directors agreed to adopt the Employer's Guarantee Scheme, and the company has purchased a block of National Savings Certificates, which are being resold through the group to employees by weekly instalments of 6d. and multiples of 6d.

Birmingham Electric Club

The Birmingham Electric Club is holding its spring golf meeting on April 22nd at Walmley Golf Club, Wylde Green. Cards and particulars can be obtained from A. T. Haywood, hon. social secretary, 24, Tamworth Road, Sutton Coldfield.

Catalogues and Lists

Straight-Lite Reflectors, Ltd., 73, Canonbury Road, London, N.1.—An illustrated and priced catalogue (list No. 46) of modern architectural lighting fittings.

Archibald Low Electrics, Ltd., Newarthill, Motherwell.—A new 20-page catalogue dealing with "Highlow" electric oil fuel heaters.

Stanelco Products (proprietors: Standard Telephones & Cables, Ltd.), Ferndown, Northwood Hills, Northwood, Middx.—An illustrated catalogue of electrode soldering equipment; also a publication giving particulars of portable electric tools, sanders, grinders and toggle presses.

Midland Electric Manufacturing Co., Ltd., M.E.M. Works, Reddings Lane, Tyseley, Birmingham.—Three new lists describing developments in protective motor control gear dealing respectively with push-button remote control stations, starters for single-phase and two-phase motors and special applications, and inset starters.

Light Production Co., Ltd., 60-66, Rochester Row, Westminster, London, S.W.1.—A leaflet giving particulars of the R. & G. liquid level alarm.

Rotherham & Sons, Ltd., Coventry.—A folder entitled "Danger Signals" describing some of the company's oil indicators which have been widely used, tested and proved reliable under exacting conditions.

Frank Whitelegg, 90, Robinhood Lane, Sutton, Surrey.—List MA giving particulars of various types of coil-winding plant.

Kolster-Brandes, Ltd., Cray Works, Sidcup, Kent.—Leaflet L.3-180 giving particulars of KB817, 4-valve, "all-dry" battery portable, superhet radio set and L.2-120 relating to the KB800, 4-valve, all-wave, battery, superhet set.

Information Department

GENERAL inquiries from readers relating to sources of electrical goods, makers' addresses, &c., are replied to by our Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

Our extensive records enable us to reply to most queries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the following:—

Address of V.H. Jackson & Co., Ltd., makers of automatic carbon arc tube welding plant.

ELECTRICITY SUPPLY

Cheap Electricity v. Rate Aid at Bolton. Stepney's Redundant Employees. Electricity-Gas Position at Halifax. Southport Traders Press for Illuminations

Blackpool.—PRINCIPLE OF OPEN TENDERS.—Referring at last week's meeting of the Town Council to the approval given by the Electricity Committee to the action of the electrical engineer in obtaining quotations for equipment, Councillor R. W. Marshall said it was a dangerous thing to do, and moved that the resolution should be referred back with instructions to advertise. Alderman G. Whittaker, chairman of the Electricity Committee, said the matter was one of emergency. The amendment was defeated.

Bolton.—RATE CONTRIBUTION POLICY DISCUSSED.—The question of grants in aid of rates came before the Town Council on April 3rd. The Transport Committee offered only £10,000 against £20,000 last year, and this was confirmed after discussion. The Electricity Committee, which last year voted £10,000, recommended no contribution this year. Councillor Cheadle said it would be no solace for a tradesman to have lower rates and yet pay more for electricity. He would lose on the bargain. In the public interest it was better to keep the price of electricity as low as possible. Councillor Longworth, chairman of the Committee, said it was estimated that there would be a loss of £533 on the year's trading and any grant must come from the "carry forward." By conserving reserves, they would delay the necessity of increasing the price of electricity. Despite this plea the recommendation not to contribute was referred back by 46 votes to 30.

LIGHTING DEPARTMENT INQUIRY.—Following the report of a committee of inquiry into the control and administration of the Lighting Department, and on the present system of audit and supervision of accounts and stores, the appointment of an internal auditor on the staff of the borough treasurer is to be considered. All further action will be taken by the Lighting Committee. While satisfied that the system of audit, &c., in the Department is proper and workable, the committee expressed the view that the lighting superintendent had failed to establish to its satisfaction that he had exercised sufficient control and supervision. The committee was also satisfied of a lack of mutual confidence, co-operation and respect between the chairman of the Lighting Committee and the lighting superintendent, the latter reporting that he had considerable interference from the chairman in the administration. The committee said it must be accepted as a general principle that a chief officer was appointed for his special technical ability and competence to control the administration of his department, and while keeping his chairman and vice-chairman fully advised he would not finally accept directions which interfered with his best judgment as to what was necessary and wise. If his plans were not acceptable to his chairman or vice-chairman he was bound to submit the matter to the whole committee.

Bradford.—APPOINTMENT OF ELECTRICAL ENGINEER.—At Tuesday's meeting of the City Council the appointment of a successor to Mr. T. Roles, city electrical engineer and manager, who retires in June, was discussed. It was decided, states the *Yorkshire Post*, that consideration of the matter should be deferred until the final report has been made by the special committee set up recently to inquire into the administration of the department. The Electricity Committee had recommended that the present deputy should be appointed to succeed Mr. Roles, subject to recommendations concerning salary being approved.

Halifax.—GREATER PROFIT THAN ANTICIPATED.—In achieving a greater profit for the year just closed than was originally estimated the Electricity Department stands practically alone among supply authorities. The original estimate was £16,470, compared with the £25,970 now disclosed. For the financial year 1940-41 it is estimated that there will be a surplus of £25,745.

EFFECT ON GAS UNDERTAKING.—When members of the Light, Heat and Power Committee met at the electricity showrooms last week Councillor E. Sugden, proposing a vote of thanks to the chairman (Alderman J. H. Waddington) and the newly appointed electrical engineer (Mr. A. G. Connell) said that while they could speak with confidence of the ultimate success of the electricity undertaking they would have to consider its relationship with the gas undertaking. Every new consumer on the electricity side, so far as the domestic supply was concerned, was one fewer for the gas industry. On this point Alderman F. A. Leach said that the Light, Heat and Power Committee had a very responsible job. He said that they had sunk a lot of capital in the gas works.

Earlier in the afternoon the new extensions at the power station were inspected.

Higham Ferrers.—COUNCIL HOUSE INSTALLATIONS.—The Housing Committee has asked the Ministry of Health to use its influence with the Rushden Electric Supply Co. to expedite the installation of electricity in Council houses now nearing completion at Upper Kings Avenue. The company has pointed out that it is fully employed on Government work and that there is a shortage of labour and materials.

Huddersfield.—CENTRAL CONTROL SYSTEM.—Approval of the Home Office is being sought for the purchase of an additional 660 units of the "Ripplay" air-raid warning system. Three hundred have already been purchased.

Hull.—SUPPLY EXTENSIONS.—The Electricity Committee is seeking sanction to borrow £32,514 for supply extensions in the suburbs and outside areas.

Kendal.—PROPOSED SUBSTATION.—At a meeting of the Town Council last week it was announced that the plans of the new substation proposed to be erected near Stricklandgate now conformed with the Electricity Commissioners' requirements and that the revised estimated expenditure was £4,427.

Lanark.—EXTENSIONS AT CLYDE'S MILL.—The County Council Town Planning Sub-committee has approved plans for the extension of the generator house and boiler house at Clyde's Mill power station, Cambuslang, for the Clyde Valley Electrical Power Co.

London.—SOUTHWARK.—Reporting upon a protest from the local Chamber of Trade against the proposed 25 per cent. increase in charges, the Electricity Committee points out that during the last war £33,407 was transferred from the rates in aid of the electricity undertaking and the Committee is now endeavouring to prevent a recurrence of this method of financing the undertaking.

REDUNDANT EMPLOYEES AT STEPNEY.—It was reported to the Council last week that 34 wiremen and inspectors in the Electricity Department had been offered alternative employment in the Council's service; 31 accepted and three left. In addition, a foreman wireman resigned. The alternative employment offered was that of painting white lines on public highways, for which the appropriate wage was paid. It was also stated that a further 21 employees, including a substation charge engineer, were, or were likely to become, redundant, and a report is to be made on what alternative employment there is available in the Council's service. Councillor Frankel said that the question of redundancy had at all times been discussed with the trade unions concerned.

Macclesfield.—CABLE-LAYING.—The Electricity Committee has agreed to a number of mains extensions, &c., as proposed by the electrical engineer (Mr. P. Clegg). It was reported that the estimated cost of cables was £20,000, and the Committee decided to invite tenders.

Morecambe.—HIGHER VOLTAGE.—The Electricity Committee is to increase the voltage of feeders from 6,600 to 11,000 V at a cost of £6,680.

Motherwell.—DIRECT LABOUR POLICY.—The Scottish Home Department has intimated to the Town Council that it has no objection to the installation for the supply of electricity at Motherwell sewage purification works being carried out by the Town Council's Electricity Department, subject to the observation of strict economy and the obtaining of the necessary sanction to borrow the capital sum involved, £2,900.

Oban.—NEGOTIATIONS WITH GRAMPIAN CO.—The Town Council has resumed negotiations with the Grampian Supply Co. for a bulk supply of electricity. The Council, it is understood, has asked the company to submit a new draft agreement under which it would buy the municipal electricity works for £12,500. The company proposes to extend its system from Killin, Perthshire, to Oban, and to supply electricity to villages between Killin and Oban.

Plympton.—SUPPLY SCHEME.—Following a report on the proposed extension of the electricity supply to Ivybridge and the laying of a high-voltage main from Plymouth to Plympton the Rural District Council has given instructions for the work to be done by direct labour.

Retford.—RURAL PROGRESS.—Supplies from the Corporation undertaking have recently been made available at West Drayton, Elkesley and Bothamsall, and out of the 55 villages in the area there are now only about five which are not yet connected to the distribution network.

Rotherham.—NEW SUBSTATION.—The Electricity Committee is to erect a substation at Brook Hill, Thorpe Hesley.

Salford.—LOAN FOR APPARATUS.—Application is being made for permission to borrow £27,500 for domestic appliances and meters.

SUBSTATION CONSTRUCTION.—It is proposed to equip substations in Regent Road and Bowman Street at a cost of £5,000. A site in Rugby Road, Pendleton, has been acquired for a substation.

Scunthorpe.—NEW CABLE.—In view of the increased demand at the Sheffield Mines the Council is to lay a larger cable for the supply at a cost of £778.

Southport.—DECORATIVE LIGHTING.—Following the decision of the Publicity and Attractions Committee not to have decorative illuminations up to black-out time the Chamber of Trade and the Hotel and Apartments Association asked that

the matter should be reconsidered. At last week's Council meeting Councillor H. W. Barber said that there was some doubt whether under any circumstances the illuminations would be allowed, and a letter was awaited from the Home Office.

Stoke-on-Trent.—Increased Supply to Newcastle-under-Lyme.—At the request of the Newcastle-under-Lyme Corporation the Stoke Electricity Committee is to lay an additional feeder to enable the bulk supply to be increased at a cost of £14,000.

Bulk Supply to Colliery.—Terms have been agreed between the Electricity Committee and the Stafford Coal & Iron Co., Ltd., for the provision of a bulk supply to the Great Fenton colliery at a cost of £8,400.

Stourport.—Electricity for Council Houses.—At a recent Council meeting the Housing and Parks Committee reported that the S.W. & S. Electric Power Co. had agreed to provide the necessary mains to make electricity available to 48 houses at Park Crescent without any contribution from the Council. It was agreed to undertake the cost of wiring the houses and to increase the rents by one penny a week from the date of installation.

Swansea.—Operation of Tir John.—Last week the Electricity Committee approved terms for the agreement between the Corporation and the Central Electricity Board on the operation of Tir John power station during the next five years by the Board and the supply to Swansea of a proportion of the output to meet the local demand. The agreement will be applicable as from January 1st last, subject to the Council's approval. The borough electrical engineer, Mr. H. E. Blackiston, and the borough treasurer, recommended acceptance of the terms as favourable and materially in advance of the minimum to which the Corporation was entitled. In reply to Councillor S. C. Jenkins the engineer said he was hoping that at the end of five years the Department would have repaid the overdraft created during the construction of the station.

Thornton Cleveleys.—Supply from Preston?—The Council is anxious to get its electricity direct from the Preston station instead of through Blackpool, and the proposal is at present under discussion.

Torquay.—Automatic Street Lighting Control.—The Highways Committee has decided in favour of a scheme for the automatic control of street lighting. This is estimated to cost between £6,000 and £7,000, but will result in an annual saving of £1,600.

Tynemouth.—Appliance Hire Charges.—The borough electrical engineer has received notification from the manufacturers of electric cookers and water heaters that the prices have been raised by 7½ per cent., but the Town Council has decided to make no increase at present in the hire charges for cookers and water heaters.

Wallasey.—Hospital Installation.—The Health Committee is to renew the electrical wiring at the Mill Lane Hospital.

Walsall.—Cookery Demonstrations.—The Electricity Committee has inaugurated wartime cookery demonstrations every Wednesday in conjunction with the National Food Campaign.

Wigan.—Maximum Rate Contribution.—The Electricity Committee is making the maximum permissible contribution in aid of the rates, amounting to £3,494.

Workington.—Supply for New Industries.—Consideration has recently been given to the necessity for increasing the electricity supply to the borough in connection with which there would be a change from 3.3 to 11 kV. Councillor I. Armstrong, chairman of the Electricity Committee, states that new industries are coming to the borough and the Committee is satisfied that it would be impossible to get these industries established unless there is an adequate supply. A scheme costing £22,948 will be spread over a number of years.

Wrexham.—Price Increase Recommendation Referred Back.—After discussing a proposed new scale of electricity charges, estimated to produce an additional annual revenue of about £4,000, the Town Council recently decided to refer the whole matter back to the Electricity Committee for further consideration.

RADIO & TELEPHONY

Great Britain.—Marconi Memorial at the Needles.—A memorial stone in grey Cornish granite has been erected on ground adjacent to the site of the original Royal Needles Hotel, Alum Bay, in the Isle of Wight, to mark the position occupied by the first permanent wireless station, where the late Marchese Marconi and engineers of Marconi's Wireless Telegraph Co. carried out a series of experiments which placed wireless communication on a firm foundation. The station was dismantled in June, 1900. The suggestion that such a memorial should be erected was made in 1938 and it has just been completed and is now open for public inspection.

Italy.—Telephone Development.—It is reported in *Revista delle Telecommunicazione* that marked progress was made during last year, to meet which considerable extensions were completed. The number of circuits in operation between Rome and Milan has risen from seven in 1926 to 39 at the end of 1939, and the number is now being increased to 53. Roughly 90 per cent. of the telephone cables in Italy are now underground. One of the longest inter-urban lines in Europe is that between Milan and Palermo, a distance of about 1,175 miles.

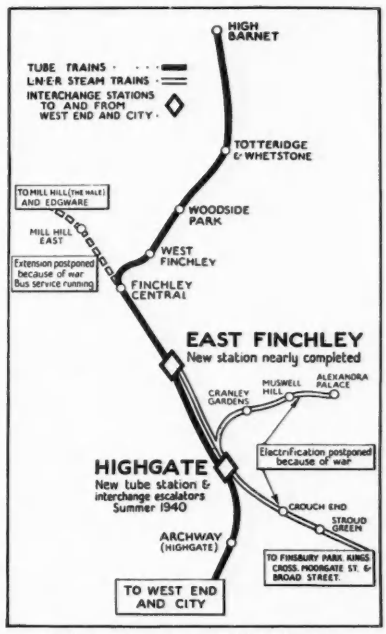
TRANSPORT

Cardiff.—Trolley-bus Route.—The Transport Committee has approved a revised estimate of £5,900 for the provision of facilities for the operation of trolley-buses on the Cathedral Road-Clarence Road route.

Darwen.—Buses Replace Trams.—Following the delivery of ten double-deck omnibuses, the Corporation has replaced trams by buses in Bolton Road. It was originally planned to effect a complete change-over to buses by April 1st, but the project had to be abandoned through the outbreak of war and on some sections trams were brought back. The poor state of overhead equipment in Bolton Road, however, made it inadvisable to operate a tram service any longer, and the necessary sanction for the substitution of buses was obtained. At peak periods buses will augment the skeleton tram service on the Blackburn-Darwen route.

Eire.—Drumm Batteries for Farm Tractors?—At a meeting of the South Tipperary Agricultural Committee last week it was decided to request the Department of Agriculture to take into consideration the possibility of utilising the Drumm battery for the propulsion of tractors. It was pointed out that Irish farmers were considerably behind other countries in mechanical progress. There were some 2,500 tractors in the country, and these were driven by oil from foreign countries. The price of oil was increasing and more foreign tractors were being imported.

London.—Tube Trains to High Barnet.—The second extension of London's Underground railways since the war will be opened on Sunday, when Northern Line tube trains will begin to run beyond East Finchley over the 5½ miles of newly electrified L.N.E.R. tracks to High Barnet thus providing the first direct railway link between High Barnet and the West End. High Barnet is 12 miles from Charing Cross, and tube trains will run between Morden and High Barnet, a distance of 23 miles. The extension has been undertaken jointly by the London & North Eastern Railway and the London Passenger Transport Board and is part of the £40,000,000 programme of extensions and new works in the London Transport area. Electrification will enable a greatly increased train service to be given. Altogether, in place of the present weekday service of 78 steam trains to and from High Barnet and Finchley Central there will be 212 tube trains to and from High Barnet and 396 to and from Finchley Central. A typical journey time will be: High Barnet to Tottenham Court Road, 30 min.



Tube extension to High Barnet

Despite the difficulties of doing such work under wartime conditions, the running of tube trains to High Barnet is starting only one month later than the date fixed before the war. Owing to the necessity of giving priority to engineering works of national importance, the proposed electrification of the L.N.E.R. line from Finsbury Park to Alexandra Palace and from Finchley Central to Edgware, together with the proposed tube extension beyond Edgware to Bushey Heath, have had to be postponed. When the new tube station is opened beneath the Highgate (L.N.E.R.) station in the summer passengers from Alexandra Palace will be able to travel to the West End by changing at Highgate and descending an escalator. By the end of this year or early in 1941 the rebuilding of the Highgate station will be completed. The cost of the extension to High Barnet, including rolling stock, is approximately £1,350,000. It is expected that many passengers who now travel by bus to join the Northern line at Golders Green will use Finchley Central station instead This should afford relief to the Golders Green branch.

Apart from the electrification of the L.N.E.R. line between East Finchley and High Barnet, the line has been equipped with automatic colour-light signalling. Four new signal cabins and three new substations have been built. Considerable rearrangement of the tracks has been necessary at East Finchley, Finchley Central and High Barnet.

NEW PATENTS

Electrical Specifications Recently Published

Compiled by a firm of chartered patent agents. The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1s. each) can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1937

35831. "Electrical remote-transmission apparatus." Allgemeine Elektricitäts Ges. December 24th, 1936. (Addition to 487457.) (513306.)

16871. "Thermionic amplifying circuits for relaxation oscillations." D. S. Loewe Radioakt. Ges. June 10th, 1937. (519011.)

16977. "Ultra short-wave circuits." Marconi's Wireless Telegraph Co., Ltd. June 4th, 1937. (519110.)

17152. "Cathode-ray tubes." Pye, Ltd., and G. Liebmann. June 9th, 1938. (519111.)

20145. "Electric measuring and/or indicating instruments." General Electric Co., Ltd., H. W. Morris and H. C. Turner. July 7th, 1938. (518919.)

20500. "Electron tubes." British Thomson-Houston Co., Ltd. July 10th, 1937. (519015.)

21104. "Electrical switches and circuit-breakers of the gas blast type." G. E. Whitehead and Whitehead Switchgear & Inventions, Ltd. July 15th, 1938. (519113.)

23621. "Electric water-heaters." F. G. Taylor. August 10th, 1938. (519017.)

23848. "High-frequency coupling devices." Johnson Laboratories, Inc. August 12th, 1937. (518968.)

23946. "Electric torches." A. J. Ransford. August 13th, 1938. (519019.)

23950. "Electric water-heaters." F. G. Taylor. August 13th, 1938. (519020.)

24013. "Electric motor controllers." Allen West & Co., Ltd., and O. T. David. August 15th, 1938. (519114.)

25283. "High-pressure metal-vapour electric-discharge lamps." General Electric Co., Ltd., V. J. Francis, A. G. Pearce, J. W. Ryde and W. R. Stevens. August 29th, 1938. (Cognate application 37285/38.) (518925.)

25933. "Electrical tuned circuits." Marconi's Wireless Telegraph Co., Ltd., and J. D. Brailsford. September 5th, 1938. (518969.)

26255. "Improvement of the electrical properties of solutions." R. Beck. November 3rd, 1937. (Cognate application 26256/38.) (518935.)

26306. "Telephone and like systems." C. E. P. Jones and R. R. Birss. September 9th, 1938. (518976.)

26365. "Electric selective control systems." Philco Radio & Television Corporation. September 9th, 1937. (518941.)

26371. "Electric timing circuits and apparatus." Siemens & General Electric Railway Signal Co., Ltd., and H. J. N. Riddle. September 9th, 1938. (519024.)

26423. "High-frequency inductance coils." W. J. Polydoroff. September 9th, 1938. (518945.)

26447. "Tuning devices for radio receivers and the like." General Electric Co., Ltd., W. R. Rose, F. Clark and A. D. Forbes. September 10th, 1938. (Cognate application 369/39.) (518979.)

26503. "Electric condensers." Fides Ges. für die Verwaltung und Verwertung von Gewerblichen Schutzrechten. September 11th, 1937. (518950.)

26505. "Electric microscopes." M. Von Ardenne and Siemens & Halske Akt. Ges. September 11th, 1937. (518951.)

26529. "Electric fuses of the cartridge type." J. A. Crabtree & Co., Ltd., H. F. McLoughlin and B. G. Harrison. September 12th, 1938. (519028.)

26548. "Photo-electric cell installations." R. Head, H. M. Baker, Perkins, Ltd., and Anciens Etablissements A. Savy, Jeanjean et Cie. September 12th, 1938. (519030.)

26704. "Automatic ticketing equipment for telecommunication exchange systems." Standard Telephones & Cables, Ltd. (M. den Hertog and L. B. Haigh). September 13th, 1938. (519041.)

26705. "Cathode-ray tubes and fluorescent screens suitable therefor. Standard Telephones & Cables, Ltd., and H. Wolfson. September 13th, 1938. (519042.)

26721. "Sparking plugs." K.L.G. Sparking Plugs, Ltd., C. M. Carrington and G. W. Shoobert. September 13th, 1938. (519045.)

26753. "Means for controlling temperatures in furnaces and similar apparatus." A. G. Lobley and Birmingham Electric Furnaces, Ltd. September 14th, 1938. (518986.)

26828. "Single-stage electron multipliers." General Electric Co., Ltd., and W. H. Aldous. September 14th, 1938. (518990.)

26829. "Wireless receiving apparatus." General Electric Co., Ltd., and W. H. Peters. September 14th, 1938. (518991.)

26842. "Boards or cabinets for electrical equipment, for instance, telephone exchange equipment." Standard Telephones & Cables, Ltd., B. B. Grace and L. H. Webb. September 14th, 1938. (519076.)

26900. "Apparatus for anodising thin wire." F. Durr. September 15th, 1937. (Cognate application 26901/38, 26902/38, 26903/38, 26904/38 and 26905/3.) (518993.)

26916. "Electric conductors connected to metallic thimbles." Marconi's Wireless Telegraph Co., Ltd. September 18th, 1937. (519117.)

26999. "Electric rectifier arrangements." Patentvertungs-Ges. Hermes. September 15th, 1937. (519125.)

27471. "Transmission of television signals over cables." H. B. Rantzen. September 20th, 1938. (519051.)

27640. "Electric stoves." W. S. Thimblethorpe. September 22nd, 1938. (519084.)

27803. "Electric - discharge tubes." Lorenz Akt. Ges. September 24th, 1937. (519087.)

28080. "Electrical condensers." R. Bosch Ges. October 2nd, 1937. (519132.)

28274. "Electric fires." Ferranti, Ltd., J. H. Watkiss and A. M. Fletcher. September 29th, 1938. (519137.)

28366. "Headlights." B. Hybler. May 4th, 1939. (Convention date not granted.) (519142.)

28476. "Sources of light, comprising both an electric-discharge tube and an incandescent filament." General Electric Co., Ltd. (Patent-Treuhand Ges. für Elektrische Glühlampen). September 30th, 1938. (519145.)

28737. "Shafts for magnets or dynamo-electric machines." R. Bosch Ges. October 7th, 1937. (518953.)

28823. "Microphones." Fides Ges. für die Verwaltung und Verwertung von Gewerblichen Schutzrechten. October 4th, 1937. (518999.)

28886. "Metal base for electric-discharge tubes." Egyesult Izzolampa es Villamossagi Reszvenytarsasag. October 5th, 1937. (519001.)

28909. "Control equipments for electric motors." A. D. Ferguson and Metropolitan-Vickers Electrical Co., Ltd. October 5th, 1938. (519003.)

29865. "Electric relays or switches with time lag devices." E. Mestitz (P. Drahonovsky). October 14th, 1938. (519150.)

31049. "High-frequency electric inductance melting furnaces." Kohle-und Eisenforschung Ges. November 19th, 1937. (519097.)

32817. "Accumulator batteries, particularly for motor vehicles." M. Folpini. September 22nd, 1938. (519103.)

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26330. "Arrangement for producing biassing potentials in circuits incorporating electron-discharge valves." L. L. De Kramolin. June 7th, 1938. (Convention date not granted. (Divided out of 513626.) (519058.)

FORTHCOMING EVENTS

April 15th (Monday).

I.E.E.—Institution, London, W.C.2. 6 p.m. Informal meeting. Discussion on "Adequate Domestic Equipment." Opened by M. Whitgift.

April 16th (Tuesday).

I.E.E. (North-Western Centre).—Engineers' Club, Manchester. 6.45 p.m. Annual general meeting. "Oil-less Metalclad Switchgear for Medium-Voltage AC Circuits up to 660V Three-Phase." By H. E. Cox and L. Drucquer.

Association of Supervising Electrical Engineers.—Lighting Service Bureau, 2, Savoy Hill, London, W.C.2. 6.30 p.m. "Factory Electrification." By G. H. Buckle. The author will deal with large factories of from 200,000 to 2,000,000 sq. ft.

April 17th (Wednesday).

I.E.E. (Sheffield Sub-Centre).—King's Head Hotel, Sheffield. 6 p.m. "Oil-less Metalclad Switchgear for Medium-Voltage AC Circuits up to 660V Three-Phase." By H. E. Cox and L. Drucquer.

Royal Society of Arts.—John Adam Street, Adelphi, W.C.2. 2.30 p.m. "Plastics as Constructional and Engineering Material." By H. V. Potter.

April 18th (Thursday).

Electrical Association for Women.—I.E.E., London, W.C.2. 10.15 a.m. Annual meeting. Park Lane Hotel. 12.45 for 1 p.m. Annual luncheon.

April 19th (Friday).

I.E.E. (Transmission Section).—Waldorf Hotel, Aldwych, W.C.2. 7 for 7.15 p.m. Informal Section dinner followed by a re-union.

April 20th (Saturday).

Junior Institution of Engineers.—Monico Restaurant. 1 for 1.30 p.m. Annual luncheon. *(Midland Section).*—James Watt Memorial Institute, Birmingham. 2.30 p.m. "Electrical Distribution." By D. Birch.

April 22nd (Monday).

I.E.E. (North-Eastern Centre).—The Newe House, Newcastle-on-Tyne. 6.15 p.m. Annual meeting. Paper by J. W. Gibson.

May 1st to 3rd.

Public Service Transport Association.—Annual congress in London. Headquarters: Hotel Victoria.

TRADE MARK APPLICATIONS

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from the dates mentioned.

March 27th

Flurolier. No. 610640. Class 11 (IV). Lighting fittings.—Benjamin Electric, Ltd., Brantwood Works, Tariff Road, Tottenham, N.17.

April 3rd

Godiva. No. 609958. Class 7 (IV). Electric generators, &c.—Coventry Climax Engines, Ltd., 16, Friars Road, Coventry.

Lucex. No. 610618. Class 9 (IV). Electric dry batteries.—Bethell Brothers, Ltd., 107-108, Upper Thames Street, E.C.4.

Trehawk (lettering and design). No. 610379. Class 11 (IV). Pocket electric lamps, torches, hand lamps and lamps for cycles.—Hawk, Ltd., Treforest Trading Estate, Pontypridd, Glamorganshire.

FINANCIAL SECTION

New Companies. Returns of Capital. Debenture Charges. Bankruptcies and Liquidations. Reports of Electrical Companies. Dividend Announcements. Stocks and Shares

New Companies Registered

Smith & Cookson, Ltd.—Private company. Registered April 6th. Capital, £10,000. Objects: To acquire the business of wholesale electrical factors and merchants, now carried on by F. K. Smith, W. J. Cookson and T. Armstrong, as "Smith & Cookson." The directors are: F. K. Smith, 150, Greenhill Road, Liverpool, 18, W. J. Cookson, 56, Forefield Lane, Great Crosby, T. Armstrong, "Honeybourne," Breckside Park, Anfield, Liverpool, and J. Harding, 25, Fuller Street, Great Crosby, Liverpool. Registered office: 22, Paradise Street, Liverpool.

Aberdare Cables (Overseas), Ltd.—Private company. Registered April 4th. Capital, £1,000. Objects: To carry on the business of manufacturers of and dealers in cables of all kinds, wires and all other articles and accessories in the cable and electrical and engineering and allied trades, &c. Subscribers: S. Disborough and J. W. Pryke, both of 18, Austin Friars, E.C.2. Solicitors: Slaughter & May, 18, Austin Friars, E.C.2.

Hill, Upton & Co., Ltd.—Private company. Registered March 30th. Capital, £9,000. To carry on the business of electricians, electrical, mechanical, and general engineers, &c. Directors: H. J. Butterfield (permanent governing director) and F. M. Butterfield, both of 304, Woodstock Road, Oxford. Secretary: F. M. Butterfield. Registered office: Radiant House, George Street, Oxford.

J. T. Wade & Son, Ltd.—Private company. Registered April 1st. Capital, £12,500. Objects: To acquire the business of hydraulic and electrical engineers heretofore carried on by J. T. Wade at Fairfield Works, High Wycombe, Bucks. Permanent managing directors: J. T. Wade, 120, Amersham Road, High Wycombe, Bucks, and S. C. Wade, 158, West Wycombe Road, High Wycombe.

L. E. Griffiths, Ltd.—Private company. Registered April 1st. Capital, £2,000. Objects: To acquire the business of a wireless and electrical engineer carried on by Lily E. Griffiths. Permanent directors: Mrs. L. E. Griffiths and J. W. Gibbon, manager, both of "Four Winds," Hough Lane, Cogshall, Ches. Registered office: 14, The Downs, Altrincham.

Suburb Radio & Electrical Co., Ltd.—Private company. Registered April 1st. Capital, £100. Objects: To carry on the business of manufacturers of and wholesale and retail dealers in wireless and television receiving and transmitting sets, and component parts, &c. Directors: M. Fine, 26, Leander Street, Liverpool, and B. Wood, 162, Higher Road, Harewood, near Liverpool. Secretary and solicitor: I. Levin. Registered office: 41, North John Street, Liverpool.

Randle Sign Co., Ltd.—Private company. Registered April 1st. Capital, £17,000. Objects: To carry on the business of inventors, designers, patentees, manufacturers, importers, exporters and general dealers in signs of all kinds, whether reflex, scintillating, changing, rotating, travelling, swing, fixed or otherwise, and all kinds of automatic and other mechanical contrivances for effective publicity and advertising, &c. Permanent directors: H. MacGuire (managing director and chairman), 10, Worple Court, Worple Road, Wimbledon, S.W.19, and J. R. C. Randle, Englemere Lodge, Ascot. Secretary: Frank S. Green.

Companies' Returns

Statements of Capital

Celestion, Ltd.—Capital, £123,100 in 37,500 preference and 85,600 ordinary shares of £1. Return dated October 25th, 1939 (filed February 12th, 1940). 35,721 preference and 25,651 ordinary shares taken up. £51,408 paid on 35,781 preference and 15,687 ordinary shares, £9,964 considered as paid on 9,964 ordinary shares. Mortgages and charges: £31,000.

Blackburn, Starling & Co., Ltd.—Capital, £12,000 in £1 shares. Return dated July 31st, 1939 (filed January 12th, 1940). All shares taken up. £8,100 paid, £3,900 considered as paid. Mortgages and charges, nil.

Alder Electrical Appliances, Ltd.—Capital, £1,500 in £1 shares. Return dated January 24th, 1940. 1,040 shares taken up. £1,040 paid. Mortgages and charges, nil.

London Electrical Co. (Sherborne Lane), Ltd.—Capital, £12,000 in £1 shares. Return dated January 24th, 1940. 9,200 shares taken up. £9,200 paid. Mortgages and charges: £200.

F. O. Coward, Ltd.—Capital, £2,500 in 1,500 ordinary and 1,000 preference shares of £1. Return dated January 27th, 1940. 1,500 ordinary and 770 preference shares taken up. £1,145 paid on 375 ordinary and 770 preference shares, £1,125 considered as paid on 1,125 ordinary shares. Mortgages and charges outstanding at date of return, nil.

E.M.F. (Electrical), Ltd. — Capital, £5,000 in £1 shares. Return dated December 16th, 1939. All shares taken up. £5,000 paid. Mortgages and charges: £2,525 4s. 2d.

Cark & District Electricity Co., Ltd.—Capital, £5,000 in £1 shares. Return dated December 31st, 1939. 4,000 shares taken up. £2,000 paid, £2,000 considered as paid. Mortgages and charges: £3,000.

Mann, Egerton & Co., Ltd.—Capital, £370,925 1s. in 250,000 preference of £1 and 2,418,501 ordinary shares of 1s. Return dated January 1st, 1940. 210,415 preference and 710,721 ordinary shares taken up. £198,920 1s. paid on 191,434 preference and 149,721 ordinary shares, £47,031 considered as paid on 18,981 preference and 561,000 ordinary shares. Mortgages and charges: £79,700.

Ellesmere Port Electrical Co., Ltd.—Capital, £500 in £1 shares. Return dated January 13th, 1940. 450 shares taken up. £251 paid, £199 considered as paid. Mortgages and charges, nil.

J. E. Creasey, Ltd.—Capital, £500 in £1 shares. Return dated December 19th, 1939. 400 shares taken up. £400 paid. Mortgages and charges, nil.

"Winkworth" Electric Car-Bells, Ltd.—Capital, £100 in £1 shares. Return dated December 31st, 1939. All shares taken up. £2 paid. £98 considered as paid. Mortgages and charges, nil.

Mortgages and Charges

Sykes & Dyson, Ltd.—Mortgage on property at Little Royd, Huddersfield, dated March 13th, 1940, to secure all moneys due or to become due from the company to Martins Bank, Ltd.

Synchronome Co., Ltd.—Issue on February 2nd, 1940, of £2,000 debentures, part of a series already registered.

Varley Dry Accumulators, Ltd.—Debenture, charged on the company's undertaking and property, present and future, including uncalled capital, dated March 12th, 1940, to secure all moneys due or to become due from the company to Barclay's Bank, Ltd.

Receiver Appointed

Locke and Soares, Ltd.—J. C. Gardner, of 24, Coleman Street, E.C., was appointed receiver on March 21st, 1940, under powers contained in debentures dated January 31st, 1939.

Company Liquidations

Leda Electric, Ltd.—Winding up voluntarily. Liquidator, Mr. J. Blakey, 42, Spring Gardens, Manchester.

Home Radio & Television, Ltd.—Particulars of claims by April 30th to Mr. P. L. Smout, liquidator.

The Electricity Company of Macclesfield, Ltd.—Winding up voluntarily. Liquidator, Mr. J. W. Davies, Central House, Kingsway, London, W.C.2. Particulars of claims by April 26th to the liquidator. This notice is purely formal. All creditors have been or will be paid in full.

Gradley Electrical Co., Ltd.—Meeting of creditors on May 2nd at 11-12, Finsbury Square, E.C. (pursuant to Section 245 of the Companies Act, 1929), to receive an account of the winding up by the liquidator, Mr. N. W. Osborne.

Bankruptcy Proceedings

F. Durant, 34, Clarence Road, Tottenham, and **W. Kearns,** 14, Ashfield Road, Finsbury, N.4, lately carrying on business as Durant & Kearns, at 68a, Bruce Grove, Tottenham, radio dealers.—These debtors attended at the Court House, Edmonton, N.9, recently for their public examination. Their joint statement of affairs showed ranking liabilities of £429 and estimated assets of £51. F. Durant's separate statement showed liabilities of £25 and no assets, and W. Kearns' separate liabilities amounted to £25 and he had no assets. The failure was attributed to severe depression and heavy losses through customers defaulting under hire-purchase agreements. The examination was adjourned for closing.

Len Spain & Co. (a firm), 376, Bearwood Road, Smethwick, radio and electrical engineers.—The first meeting of creditors was held at the Official Receiver's Office, Somerset House, 37, Temple Street, Birmingham, recently. The statement of affairs showed ranking liabilities of £622 and estimated assets of £149, leaving a deficiency of £473. The case was left in the hands of the Official Receiver, as trustee.

R. S. Newman, radio dealer, 182, Keresley Road, Coventry, lately trading at 22, Wyley Road, Coventry. Last day for receiving proofs for dividend May 9th. Trustee, Mr. T. J. Prentice, 10, Queen's Road, Coventry.

R. S. Douthwaite, wireless and electrical dealer, 156, Church Street, Whitby.—Public examination April 16th at the Court House, Scarborough.

H. J. Fowlie, electrical engineer, 40, Queen Street, Maidenhead.—Public examination April 26th at the Town Hall, Windsor.

F. F. C. King, radio trader, 235, Banbury Road and other addresses in Oxford.—Last day for receiving proofs for dividend April 15th. Trustees, Mr. R. J. Piggott, 1-5, Broad Street, Oxford, and Mr. C. Latham, 185-188, High Holborn, London, W.C.1.

W. E. Sparrow and **F. Sparrow** (Sparrow & Co.), electrical contractors, 8, Longsmith Street, Gloucester.—First and final dividend of 2s. 1½d. in the £, payable at 26, Baldwin Street, Bristol.

Reports and Dividends

A. Reyrolle & Co., Ltd., held their annual meeting on April 4th when Mr. N. Merz (chairman) said that the balance sheet showed considerable changes compared with the position at the end of the previous year, capital expenditure incurred having amounted to £145,681. The improvements in design of switchgear which had been, and were being, brought into effect demanded greater accuracy in production which in turn called for a large number of precision machine tools and these were also required in connection with the special work which the company had undertaken as distinct from its normal productions; the greater part of the above expenditure was incurred in this respect.

Reference was made last year to the necessity for installing additional testing facilities consequent upon an agreement which had been entered into with the National Physical Laboratory and for dealing with their increased load. Orders had been placed for additional testing plant, but the expenditure did not mature before the end of the year. Consequently the amount which was charged to development account was small, and they did not think it was necessary to make

any further transfer to the credit of that account in 1939.

As regards trading, sales amounted to approximately the same figure as in the previous year, although the orders received were very much greater and there was, in consequence, a larger amount of work in hand at December 31st than ever before in the history of the company. They were making allowances to all employees who joined the forces on the outbreak of war. C. A. Parsons & Co., in which they held a large interest, had had a good year, and the Parolle Electrical Plant Co. had also extended largely its sphere of action and had undertaken important contracts, including some for power plant at new Government factories. They had made a small capital investment in a company manufacturing switchgear in France.

The maintenance of electric power supply, in which switchgear formed such an important item of plant, was of the greatest importance under present conditions and was recognised as having a high priority in the national effort called for from industry and they were continuing to obtain and to supply their full share of requirements in this country. They were also making their contribution by maintaining their supply to the overseas markets. They had recently commissioned in important power stations metalclad gas-filled switchgear of a new type, capable of operating at exceptionally high powers and speeds. Further installations of the same kind were in hand, and other more recent types of switchgear were in production. Their technical development policy, as regarded design and production, was being maintained.

Switchgear & Cowans, Ltd.—Presiding at the annual meeting held on April 3rd Mr. H. Burroughes (chairman) said that the year under review had been a difficult one. The reasons for the reduction in profits were mainly twofold. First, there was for a part of the year a considerable falling-off in the demand for their products due largely to the uncertainty of the international situation, and consequently the competition for such orders that were available proved very keen and prices fell to a low level. Secondly, they undertook a heavy and costly programme of research and development work on new types of switchgear, necessitating a rapid and intensive series of tests to prove that all their gear would comply with the requirements of the British Standard Specifications.

As a result of the research and development expenditure they had succeeded in acquiring substantial orders at reasonable prices for the new gear, but in view of the uncertainties of the present international situation they had adopted the conservative attitude of writing off the whole of this expense from the 1939 profits. Unless the war caused a decrease in the demand for their products, the work which they did last year should enable them to show a substantial improvement this year. Their order book was substantially better than it was at this time last year, both in volume and prices. Generally speaking, their position was much stronger than it was a year ago.

Ericsson Telephones, Ltd., held their annual meeting on April 3rd, when Colonel Sir Harold A. Wernher (chairman) said that the accounts for the year under review showed how effectively the company had been able to meet the initial strain of war conditions. As was to be expected, the demand in the home market for telephone equipment had been adversely affected by present conditions but, as in the last war, their plant was being used to an ever-increasing extent on contracts for the Defence Ministries.

The Government had rightly drawn attention to the vital importance of maintaining a large export trade during the war, in order to help finance our essential imports of food and raw materials. Their own sales overseas represented a substantial portion of their turnover and they were vigilant in holding and stimulating this branch of their trading. With regard to the new processes for the manufacture of metallic powders, and a high dispersive form of red lead, the rights for which they had acquired, an accident destroyed the results of many months' labour. They anticipated, however, that they would shortly be in a position to resume their interrupted deliveries against substantial orders which they had in their order books for these products.

Referring to the outlook for the current year, Sir Harold said that their home trade was changing over largely to contracts with the Defence Ministries, but the telephone system of the country was an integral part of national defence. He inferred, therefore, that the modified programme of the Post Office would not be too drastically cut. Their export trade was well maintained and altogether they had work in hand to keep them well employed for months to come. After the war the Government would be faced with the problem of absorbing many hundreds of thousands of people into civilian life again. The telephone industry could help considerably in this rehabilitation. In the public telephone system they had a valuable national asset suitable for much greater development, producing a satisfactory return on capital outlay and capable of providing a wide and well-balanced range of skilled and unskilled labour.

The Isle of Thanet Electricity Supply Co., Ltd., held its annual meeting on April 5th, when Mr. A. R. Hoare (chairman and managing director) said that the sales of electricity up to the end of August last exceeded those for the corresponding period of 1938 by about 500,000 kWh, and the trading profits showed an increase of £2,000 for the same period. Upon the outbreak of hostilities, however, their position immediately became serious, and as the result of a conference with the joint committee of the Margate Corporation and the Broadstairs U.D.C. it was agreed that they should revise their tariffs to consumers by an overall increase of 15 per cent. as from the commencement of the current year. It was hoped that such revisions, coupled with other somewhat improved local conditions, might enable them to show slightly better returns than they had considered possible for the early months of the present year, but the Thanet district was essentially a holiday area where any load of an industrial nature was practically non-existent, and the prospects for the coming season were therefore problematical.

At the close of the year there were 12.876 consumers connected to their mains, a reduction of 190 from those of the previous year, although they had provided 815 services to new consumers during the period. These were, unfortunately, offset by reason of more than 1,000 disconnections caused by removals from the district. The sales of electricity amounted to 8.9 million kWh. as compared with 9.6 million kWh in 1938, the comparatively small total reduction being due to considerably increased output during the pre-war months.

Worthington-Simpson, Ltd.—At the annual meeting held on April 5th Mr. J. Southern (managing director) said that again he could report a satisfactory order book. The productive capacity of the works would be taxed to the utmost during the year in an endeavour to meet the demands made upon them for their normal products at home and abroad, coupled with the special demands by various Government Departments.

The Watford Electric & Manufacturing Co., Ltd.—Presiding at the annual meeting held on April 4th Mr. A. C. Gascoine said that the results for the year under review were satisfactory. The value of orders received during the year was considerably more than in the previous year and left them a larger surplus of orders with which to commence the new year.

W. T. Henley's Telegraph Works Co., Ltd.—In a circular letter to ordinary stockholders, the company states that it has been customary to declare a final dividend in April and to hold the annual meeting at the end of April or early in May, but owing to the outbreak of war it will not be possible to keep to these dates this year. There has been considerable delay in the receipt of accounts from overseas branches and agencies, and war conditions are causing other unavoidable delays. The business of the company has been maintained, and the directors hope that the accounts may be completed so as to enable the final dividend to be declared in the latter part of June, and the annual meeting to be held shortly afterwards.

The Anglo-Portuguese Telephone Co., Ltd., reports a net profit for 1939 of £81.853, as compared with £78.967 for 1938 which, with £32,371 brought in, makes £114,224. It is proposed to pay a final dividend of 5 per cent. on the ordinary stock, making 8 per cent. for the year (same), and a dividend of 8 per cent. (same) on the "A" ordinary shares. A sum of £13,000 is placed to contingencies, and £35,355 is carried forward. The report states that stations increased by 1,408, the total at December 31st being 52,506. Since the date of the accounts the company has obtained Treasury consent to issue by private placing £200,000 of the new 5 per cent. stock. The stock has been sold to the Telephone & General Trust for cash, and the proceeds have been utilised in reduction of loans owing to the Trust.

Hall Telephone Accessories, Ltd., reports a net profit for 1939 of £41,606, as compared with £73,862 in the preceding year. The final dividend is 5 per cent., making 10 per cent. for the year (against 10 per cent., plus a bonus of 5 per cent.).

The Shropshire, Worcestershire and Staffordshire Electric Power Co. reports a net revenue for 1939 from sales, rentals and other sources of £846,958, as compared with £727,927 for the preceding year, which with income from subsidiaries, a £40,000 transfer from tax reserve and other receipts, gives a total of £927,778, an increase of £98,169. The net profit is £614,017, an increase of £58,683. General reserve receives £290,000, and reserve for contingencies, £25,000. As we have already announced, the "A" ordinary dividend for the year is maintained at 8 per cent., and the "B" ordinary at 5½ per cent. The balance carried forward is £72,194 (against £66,927 brought in).

The Northern General Transport Co., Ltd., reports a net profit for 1939 of £178,315, to which is added £49,526 brought in, making £227,840. Reserve receives £50,000, employees' assistance fund £3,000, and it is proposed to pay a final ordinary dividend of 6 per cent., making 10 per cent. for the year. The balance carried forward is £72,232.

The Jarrow and District Electric Traction Co., Ltd., reports a surplus for 1939 of £5, which has been added to £114 brought in, leaving a balance of £119 to be carried forward.

The Gateshead & District Tramways Co. reports a net profit for 1939 of £28,536, as compared with £32,292 for the previous year. The ordinary dividend for the year is maintained at 10 per cent., and £43,709 is carried forward (against £44,141 brought in).

Sangamo Weston, Ltd., reports a trading profit for 1939 of £85,841, as compared with £130,013 for the previous year, and a net surplus of £33,672 (against £77,093). The dividend for the year is 5 per cent. (against 15 per cent.). general reserve receives £20,000, and £32,922 is carried forward (against £85,426 brought in).

The Cambridge Electric Supply Co., Ltd., reports a net profit for 1939 of £36,231, which with £10,166 brought in makes £46,397. It is proposed to pay a final dividend of 4½ per cent. on the ordinary shares, making 7 per cent. for the year and to carry forward £11,397.

The Galloway Water Power Co. reports a net revenue for 1939 of £30,056, as compared with £26,296 for the preceding year. The final dividend is 9 per cent., maintaining the distribution for the year at 14 per cent., and £8,442 is carried forward (against £1,507 brought in).

Allen West & Co., Ltd., report a net profit of £62,654 for 1939, as compared with £101,050 for 1938. The dividend for the year is 7½ per cent. (against 7½ per cent. plus 2½ per cent. bonus).

Newman Industries, Ltd., reports a profit for 1939, after providing for depreciation, of £43,108, as compared with £33,192 for the previous year. The dividend on the cumulative preferred ordinary shares is 6 per cent., plus 2 per cent.. (same) and on the ordinary shares 20 per cent. (same). General reserve receives £10,000 and £2,000 is placed to 6 per cent. redeemable cumulative preference redemption. The balance carried forward is £11,936 (against £8,429 brought in).

The Aktiebolaget Separator, of Stockholm, reports a net profit for 1939 of Kr. 7,731.814, as against Kr. 7,919.152 for 1938. It is proposed to pay an ordinary dividend of six crowns per share (same) and to carry forward Kr. 2,008,076 (against Kr. 1.778,263 brought in).

(*Continued on page 443.*)

STOCKS AND SHARES

Tuesday Evening.

THE invasion of Norway and Denmark by Germany, if not wholly unexpected in the City, led to a natural weakening of prices. This applied alike to investment and speculative securities. There was no particular selling in any one market. Evidently holders of the popular stocks are content to keep them, and will refuse to be hustled out by developments abroad. On the other hand, the volume of business suffers severe interference and it is not surprising that prices should show a tendency to go down. Buyers are, for the moment, conspicuously absent and while, as just remarked, there is no particular pressure to sell, the lack of purchasing power renders prices liable to give way—to use a hackneyed phrase—of their own weight.

Electricity Supply

The Electric Supply Corporation is making a small reduction in the final dividend, which is to be 8 per cent. (against 8½ per cent. last year) subject to tax "at the standard rate ruling after the forthcoming Budget." With the 3½ per cent. interim (less tax at 5s. 6d.) the total distribution is 11½ per cent., on which the shares, at 44s., show a yield of 5¼ per cent., allowing for the dividend in the price. The latter was not affected by the decision. The Company is interested in the Hendon Electric and a group of undertakings chiefly in Sussex. Dividends of 11 per cent. were paid regularly for many years before the increase to 12 per cent. in 1936. Accounts of the position of the Clyde Valley and Midland Electric Power companies, at their annual meetings, made a good impression. As a whole, the market in electricity supply shares shows a majority of small declines. County of London, 37s. 6d., Midland Counties, 36s. 3d., Lancashire Light and Power, 32s., and British Power and Light, 28s., are lower. West Gloucestershires are again 1/6 up at 21s. 3d. Edmundsons 7 per cent. preference hardened to 31s. 3d. The "Three Counties" 6 per cent. preference are changing hands on the basis of 28s. 6d.

Company News

Laurence, Scott & Electromotors' profit for 1939 is within a few pounds of the previous year's figure, and the dividend is again 15 per cent. The 5s. shares stand at 11s., yielding over 6¾ per cent. on the money. The Allen West profit of £63,000 compares with one of over £100,000 previously; the 7½ per cent. dividend is unaccompanied this time by the 2½ per cent. bonus distributed a year ago. At 5s. 6d. ex dividend, the price of the 5s. shares is 9d. lower, and shows a yield of 5¼ per cent. on the reduced distribution. Telegraph Condenser is diminishing its preference dividend arrears by the payment of a half-year's interest. The dividend is now twelve months behindhand. The ordinary shares have received dividends up to 20 per cent. since the registration of the company in 1933, but have had no return since 5 per cent. was paid for 1937.

The Telephone in Wartime

Last week's annual meetings of both the Ericssons and Automatic Telephone and Electric Companies shed a good deal of light on the position in which the telephone manufacturing concerns find themselves during wartime. Details were, of course, missing, but the broad impression that much of the industry's energies have been switched to war work, is now confirmed. Naturally enough, the industry is concerned to see that normal business is not unduly neglected. The telephone's vital part in the nation's military, commercial and social systems was strongly stressed at both meetings.

The Post Office is closely watched for the development of its wartime telephone policy. According to the chairman of Automatic Telephone and Electric, the Post Office is taking a broad view in seeing that the telephone manufacturing situation is kept in hand during the changeover to war work, and that reserves of equipment are created. The telephone was described as being as essential as a machine tool. The chairman of Ericssons inferred that the programme of the Post Office would not be too drastically cut, and, looking ahead, he cited the industry as an excellent subject for development in the awkward process of post-war readjustment.

Export business figures largely, as a rule, in the telephone manufacturers' contracts, and the Government will doubtless lend encouragement to their efforts to expand overseas orders. That Portugal is proceeding undeterred with the development of her telephone system is of particular importance to the Automatic company. (Anglo-Portuguese Telephone has just declared the usual dividend, making 8 per cent. for the year, profits showing a modest increase.) Hall Telephone Accessories announces a final dividend, making 10 per cent. for the year, but last year's 5 per cent. bonus is omitted, profits showing a contraction. The shares have fallen 2s. to 16s. 3d.

Switchgear and Cowans

Shareholders of Switchgear and Cowans had to wait until last week's annual meeting for the explanation of the heavy drop in profits and dividend. In the form of the bald announcement, the setback had caused sufficient surprise to depress severely the value of the shares. The explanation, when it came, brought such reassurances as to lift the quotation by about a florin. Unsettled trading conditions in the first part of the year take some of the responsibility for the lower profits; but, as now transpires, the board also adopted the conservative step of charging against current profits the whole expense incurred in connection with a costly programme of work on new types of switchgear. Substantial orders have already been received, at reasonable prices, for the new gear, and, in the ordinary course of events, last year's spade work can be expected to lead to better things in the future. The order book is fuller and, in general, the position stronger than was the case a year ago.

Equipment and Manufacturing

While lacking anything like general animation, the industrial markets are enlivened here and there, in this season of dividends, reports and meetings, by developments or announcements affecting individual shares. Results declared by the bigger companies have, also, a decided influence on the tone of industrials as a whole. Thus the disclosure last week of excellent figures by two such industrial giants as Imperial Chemical Industries and Dunlop Rubber helped to cheer the market. In the electrical group, similar contributions to the general benefit have recently been made by such concerns as Associated Electrical Industries, Telegraph Construction and the other cable manufacturers. Leading shares in the electrical equipment market are little changed on the week, among the few quotable alterations being reactions in Callenders from 66s. 3d. to 65s., and in Ever Readys from 27s. to 26s. 6d. Revo at 17s. 6d. are 2s. 6d. down.

Vickers Capital

That Vickers 10s. shares should now be quoted at 17s. 6d., compared with over 20s. shortly before the appearance of a satisfactory report, is due in part to the non-appearance of the capital bonus which is perennially expected in some quarters. The chairman has now gone out of his way to state the position in all clarity. The company's reserves, he points out, are not in themselves of such proportions in present circumstances as to provide for a bonus. A writing-up of the capital at this stage would involve an upward revaluation of the chief assets. Very likely the latter are worth, under to-day's conditions, more than the balance-sheet figures. Past experience, however, compels a conservative attitude in the matter. It is true that a large part of the wartime expansion of plant, &c., is the Government's financial responsibility. Yet the possibility remains that assets written up now, might have to be written down again later. Few will disagree with this plain reasoning.

Indian Electricity

Madras Electric Supply Corporation £1 shares are in the market at 26s. 6d. After receiving 8 per cent. tax-free dividends regularly for a number of years, shareholders have been officially warned to expect a reduction to 6 per cent. tax-free this year. On the latter basis, the yield works out at 4½ per cent. net, equivalent to over 7 per cent. gross, taking tax at 7s. 6d. in the pound. The progressive character of the undertaking is marked by the quintupling of the output over the past decade, accompanied by an increase in net annual revenue from £120,000 to £159,000. The final dividend is due next month, an interim of 2 per cent. having been paid last November. Calcutta Electric shares can be bought at 36s. to give the rather higher yield of £4 19s. per cent. net on the 9 per cent. tax-free dividend which next month's payment is expected to make for the year.

Traction and Transport

Brazilian Traction shares have revived strongly, together with hope of an early return to the dividend list. No dividend has been paid since the middle of 1938 owing to the Company's inability to remit money from the country. Now that the tide of trade seems to be turning in Brazil's favour, expectation looks for an easing of the currency restrictions that would give the Company a chance to turn into sterling a part of the excellent profits which are apparently being made in the local currency. The price of the shares at $12 is up $1¼ on the week. The market in Home Railway stocks has again given a good account of itself, with hopes running upon an early announcement on the matter of raising fares and charges. London Transport "C" stock, which is a point better at 45, has joined in the upward movement of the junior stocks of the main line companies. The German aggression led to a reaction in these issues, and, as already noted, to a disposition towards lower prices in other markets.

Electricians' Rubber Gloves.—The result of the revision of the specification for rubber gloves for electrical purposes, B.S. 697, is a clarification of the original wording, particularly as regards the interpretation of the mechanical tests. Numerous changes have been made in the appendices describing the methods of test, and in a few instances these changes have necessitated alteration of the limits in the specification. Copies of these specfications may be obtained from the British Standards Institution, 28, Victoria Street, London, S.W.1, price 2s. 2d. each, post free.

ELECTRICAL COMPANIES' SHARES

Prices, Dividends and Yields

Company	1940 Highest	1940 Lowest	Dividend Previous	Dividend Last	Price April 9	Rise or Fall	Yield p.c. £ s. d.
Home Electricity Companies							
Bournemouth and Poole	63/6	57/–	15	15	62/6	—	4 16 0
British Power and Light	30/–	25/3	7	7	28/–	–6d.	5 0 0
City of London	28/–	26/–	7½	7½	26/–	—	5 15 5
Clyde Valley	38/6	33/–	8	8	37/–	–6d.	4 6 5
County of London	43/3	34/6	10½	10½	37/–	–1/6	5 13 6
Edmundson's:							
7% Pref.	31/–	28/–	7	7	31/3	+1/6	4 9 7
Ord.	27/6	21/9	9	6	25/6	—	4 12 4
Elec. Dis. Yorkshire	40/3	35/9	9	9	38/9	–1/6	4 16 0
Elec. Fin. and Securities	41/–	40/–	12½	12½	40/–	—	6 5 0
Elec. Supply Corporation	45/9	41/–	12	11½	44/–	—	5 4 7
Isle of Thanet	16/–	15/–	4	4	15/–	—	5 6 8
Lancs Light and Power	33/–	28/6	7½	7½	32/–	–6d.	4 13 9
Llanelly Elec.	21/–	19/6	5½	5½	21/–	—	5 4 9
Lond. Assoc. Electric	21/–	18/9	7	5½	19/6	–6d.	5 12 10
London Electric	37/6	26/3	8	7¼	27/–	—	5 7 8
London Power Deb. Red.	105½	103	5	5	104½	—	4 15 6
Metropolitan	41/6	36/–	12	10	37/–	–1/9	5 8 1
Midland Counties	39/–	32/9	8	8	36/3	–9d.	4 8 6
Mid. Elec. Power	40/–	36/–	8	9	38/9	—	4 13 0
Newcastle Elec.	29/9	26/–	7	7	28/9	—	4 17 5
North Eastern Electric:							
Ordinary	31/6	26/6	7	7	29/–	–6d.	4 16 7
7% Pref.	32/6	30/–	7	7	31/6	+6d.	4 9 0
Northampton	48/–	41/–	10	10	42/6	—	4 15 0
Notting Hill 6% Pref. (£10)	10¾	10	6	6	10¾	—	—
Northmet Power:							
Ordinary	42/3	35/6	10	10	37/6	–1/6	5 6 8
6% Pref.	29/–	26/9	6	6	29/0	—	4 2 9
Richmond Elec.	24/6	22/9	7	6	23/9	—	5 1 1
Scottish Power	38/–	31/9	8	8	36/3	+6d.	4 8 6
Southern Areas	21/3	18/6	5	5	20/6	—	4 17 7
South London	23/3	22/–	7	7	22/6	—	6 4 3
West Devon	20/–	18/9	5	5	18/9	—	5 6 8
West Glos.	19/6	16/6	2	2½	21/3	+1/6	2 10 0
Yorkshire Elec.	40/–	33/3	8	8	38/9	—	4 2 5
Overseas Electricity Companies							
Atlas Elec.	4/–	2/6	Nil	Nil	3/3	–3d.	—
Calcutta Elec.	37/–	30/–	10*	10*	35/6	–6d.	—
Cawnpore Elec.	30/–	29/6	10	10	28/9	—	—
East African Power	24/9	23/3	7	7	24/6	—	5 14 3
Jerusalem Elec.	24/–	21/6	7	7	24/–	—	5 16 8
Kalgoorlie (10/–)	12/6	9/6	7½	7	12/6	—	5 12 0
Madras	26/9	26/–	8*	8*	26/3	—	—
Montreal Power	35½	31	1½	1½	34	—	—
Palestine Elec. "A"	25/–	23/–	7½*	5*	25/–	—	4 0 0
Perak Hydro-electric	20/3	17/3	6	2½	17/6	—	2 17 4
Shawinigan Power	27½	20	83cts.	90cts.	24½	+¾	—
Tokyo Elec. 6%	69	59½	6	6	67½	–1	8 15 2
Victoria Falls Power	75/9	67/9	12½	15	74/6	—	4 0 6
Whitehall Investments Pref.	17/9	12/6	7½	7½	16/6	–6d.	9 1 10
Public Boards							
Central Electricity:							
1950–70	110½	107	5	5	109	—	4 11 7
1955–75	112½	108½	5	5	111	—	4 10 0
1951–73	107½	103	4½	4½	107	—	4 4 0
1963–93	96½	90	3½	3½	95½	—	3 13 8
London Elec. Trans Gtd.	92	87½	2½	2½	91	—	2 15 0
London & Home Counties							
1955–75	113¾	109	4½	4½	106½	—	4 4 6
Lond. Passenger Transport							
A	116	104	4½	4½	109½	—	4 2 2
B	116	103	5	5	110½	+1	4 10 6
C	65¼	42¾	1½	—	45½	+1½	—
West Midland Joint Elec., 1948–68	106½	105	5	5	106½	—	4 14 0
Telegraph and Telephone							
American Tel. & Tel.	215	205	9	9	212½	+2½	4 4 8
Anglo-Am. Tel.:							
Pref.	100½	93½	6	6	99½	+1	6 0 7
Def.	23⅜	21	1½	1½	22	–1	6 16 4
Anglo-Portuguese	22/3	19/9	8	8	22/6	—	7 2 3
Cable & Wireless:							
5½% Pref.	99¾	94	4½	5½	95½	–1	5 15 0
Ord.	65	56	4	4	61½	—	6 10 0
Income	99¾	93	—	—	99½	—	4 0 5
Canadian Marconi $1	6/–	4/6	Nil	4cts.	5/6	+3d.	—
Globe Tel. & Tel.							
Ord.	32/3	28/6	7½*	7½*	32/6	+1/6	4 12 4
Pref.	28/9	24/6	6	6	28/9	—	4 3 5
Great Northern Tel. (£10)	20	18	20	20	19½	—	10 5 4
Inter. Tel. & Tel.	5⅜	4½	Nil	Nil	5	—	—
Marconi-Marine	30/–	26/3	7½	10	28/9	—	6 19 4
Oriental Telephone Ord.	2⅞	56/–	12*	12*	2⅞	+1/16	4 5 5
Telephone Props.	14/–	13/3	5	6	15/–	+1/3	8 14 6
Telephone Rentals (5/–)	9/6	7/6	10	10	9/–	—	5 11 1
Western Union	34	28	2¾	—	30½	–2	—
Traction and Transport							
Anglo-Arg. Trams:							
First Pref. (£5)	4/3	3/3	Nil	Nil	4/–	—	—
4% Inc.	11	7½	Nil	Nil	11½	—	—
British Electric Traction:							
Def. Ord.	830	629	5	5	750	—	—
Pref. Ord.	169	147	8	8	165	—	4 17 0
Bristol Trams	48/6	42/–	10	8*	48/3	—	3 6 6
Brazil Traction	12	9½	$1	50c.	12	+1¼	—
Calcutta Trams	24/–	22/6	8	8	23/6	—	6 16 2
Cape Elec. Trams	17/–	16/–	5	5	16/6	—	6 1 3
Lancs Transport	35/–	28/3	10	10	35/–	—	5 14 3
Mexican Light:							
1st Bonds	33	28	5	5	30½	—	—
Rio 5% Bonds	85	74	5	5	90	—	5 11 1
Southern Rly.:							
5% Prefd.	79	64	5	5	70	—	7 2 10
5% Pref.	104½	89¾	5	5	100½	—	4 19 6
T. Tilling	45/9	36/9	10	10	42/–	—	4 15 3
Tilling & B.A.	47/6	43/9	9*	8*	47/6	—	3 7 10
West Riding	35/–	28/6	10	10	33/6	—	5 19 5
Equipment and Manufacturing							
Aron Electricity Ord.	17/6	15/0	15	15	17/6	—	—
Assoc. Elec.:							
Ord.	43/3	37/9	10	10	39/6	—	5 1 3
Pref.	35/3	32/3	8	8	35/–	—	4 11 5
Automatic Telephone & El.	47/3	42/–	12½	12½	45/–	—	5 11 1
Babcock & Wilcox	50/–	42/–	10	12½	45/–	–9d.	5 11 1
British Aluminium Ord.	56/–	48/3	12½	12½	53/9	—	4 13 0
British Insulated Ord.	92/6	78/9	20	20	86/3	—	4 12 10
British Thermostat (5/–)	14/9	11/9	18½	18½	13/3	—	6 19 7
British Vacuum Cleaner (5/-)	12/6	8/6	40	12½	12/6	—	5 0 0
Brush Ord.	4/–	3/–	Nil	Nil	4/6	—	—
Callender's	69/–	59/6	20	15	65/–	–1/6	4 12 4
Chloride Elec. Storage	72/6	68/–	20	15	3½	—	4 5 9
Consolidated Signal	68/–	59/–	36½	17	3½	—	5 4 7
Crabtree (10/–)	24/9	21/–	17½	17½	23/9	—	7 7 4
Crompton Parkinson:							
Ord. (5/–)	20/–	17/–	15	20	18/9	—	5 6 8
E. K. Cole (5/–)	5/–	3/3	10	Nil	3/6	—	—
Elec. & Musical Industries (10/–)	10/3	7/9	5	Nil	8/6	—	—
Electric Construction	35/9	32/6	12½	13½	35/–	—	7 14 4
Enfield Cable Ord.	56/–	46/3	25	16½	53/9	—	6 0 10
Electrical Switchgear (10/–)	20/–	22/6	16	10	21/3	—	4 14 3
English Electric	33/9	29/6	10	10	33/3	—	6 1 0
Ensign Lamps (5/–)	15/3	13/9	25	25	13/9	—	9 1 10
Ericsson Tel. (5/–)	39/3	33/9	25*	25*	36/3	—	3 9 0
Ever Ready (5/–)	27/6	26/–	35	30	26/6	–6d.	5 13 2
Falk Stadelmann	18/3	17/6	10	6	17/6	—	6 17 4
Ferranti Pref.	24/9	23/–	7	7	23/9	—	5 18 0
G.E.C.:							
Pref.	32/6	28/–	6½	6½	32/–	—	4 1 3
Ord.	83/3	74/3	17½	20	80/–	—	5 0 0
Greenwood & Batley	25/6	22/–	15	10	25/–	—	12 0 0
Hall Telephone (10/–)	18/6	18/–	15	10	16/3	–2/–	6 3 1
Henley's (5/–)	21/6	17/9	20	20	20/9	—	4 18 1
4½% Pref.	21/3	20/6	4½	4½	21/3	—	4 4 8
Hopkinsons	46/9	42/6	12½	15	45/–	–1/6	6 13 4
India-Rubber Pref.	21/–	20/3	5½	5½	20/9	—	5 6 0
Intl. Combustion	121/3	110/–	32½	32½	5⅞	—	5 10 6
J. Lucas	60/6	53/3	15	15	57/6	—	5 4 5
Johnson & Phillips	50/6	42/3	12½	12½	50/–	—	5 0 0
Lancashire Dynamo	59/9	53/–	25	20	55/–	—	7 5 6
Laurence Scott (5/–)	11/–	9/3	15	15	11/–	—	6 16 4
London Elec. Wire	25/–	25/–	12	7½	25/–	—	6 0 0
Mather & Platt	46/6	36/3	13½	10	41/3	+6d.	4 16 9
Metropolitan Elec. Cable Pf.	22/–	21/3	5½	5½	21/3	—	5 3 6
Murex	86/9	77/6	20	20	81/3	—	4 18 6
Pye Deferred (5/–)	7/6	7/–	25	25	8/6	+1/–	15 12 6
Revo (10/–)	20/9	20/–	17½	17½	17/6	–⅛	10 0 0
Reyrolle	60/6	56/3	12½	12½	57/6	—	4 7 0
Siemens Ord.	23/9	19/6	7½	7½	23/9	—	6 6 4
Strand Elec. (5/–)	2/3	1/9	10	4	2/–	—	8 0 0
S. Smith (1/–)	8/–	7/–	37½	50	7/6	—	6 13 4
Switchgear & Cowans (5/–)	11/9	7/6	20	10	9/6	+2/–	5 5 3
Telegraph Condenser (10/–)	8/9	6/3	5	—	8/9	—	—
Telegraph Construction	42/6	32/6	10	10	36/3	—	5 10 4
Telephone Mfg. (5/–)	8/9	7/9	9	9	9/–	+3d.	5 0 0
Tube Investments	96/9	87/9	23¾	23¾	92/6	—	5 4 6
Vactric (5/–)	3/3	2/–	4	Nil	3/6	+3d	—
Vickers (10/–)	22/–	16/6	10	10	17/6	–9d.	5 11 0
Ward & Goldstone (5/–)	19/9	19/9	20	20	19/9	—	5 1 3
Westinghouse Brake	46/–	32/9	17½	10	43/9	—	4 11 5
Walsall Conduits (4/–)	26/–	23/9	55	55	26/3	—	8 7 8
West, Allen (5/–)	7/–	5/–	10	7½	5/6xd	–9d.	5 15 5

* Dividends are paid free of Income Tax.

CONTRACT INFORMATION

Particulars of work for which tenders are invited, contracts placed, and building schemes promising work for electrical contractors and traders

Contracts Open

*Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses. Further details of items marked with an asterisk can be obtained from the Department of Overseas Trade (Inquiry Room), Great George Street, London, S.W.*1.

Australia. — MELBOURNE.—April 30th. State Electricity Commission of Victoria. Feed-water heating and evaporating plant, boiler feed pumps, pipework and accessories. (March 29th.)

Bath.—April 15th. City Council. Materials for one year. (March 29th.)

Belfast.—April 12th. Electricity Department. 120-kW mercury arc rectifier equipment. (March 29th.)

April 18th. Town Council. Maintenance of the electrical installation in the Museum and Art Gallery. Forms of tender may be obtained from the Museum, Stranmillis Road, Belfast.

Birkenhead.—April 16th. Electricity Department. Stores for six months from July 1st, 1940. (April 5th.)

Birmingham. — May 10th. Electric Supply Department. Cable jointing compound for the year ending June 30th, 1941. (April 5th.)

Blackpool.—April 17th. Gas Department. Installation of an internal telephone system at the new gas works, Marton. (See this issue.)

Cardiff.—April 17th. Town Council. Two vertical-spindle electric motor-driven sewage pumps of the submerged open-impeller type, with all accessories, and each capable of delivering 18,000 gal. per hour, at the Llandaff North pumping station. Two similar type sewage pumps, each of 42,000 gal. per hour capacity, at the Mainly pumping station. G. H. Whitaker, City Hall.

Eire.—MONAGHAN.—April 17th. Mental Hospital Committee. Electrical installation in the new hospital and nurses' home at the Mental Hospital. Nicholas O'Dwyer, 6, Burlington Road, Dublin (deposit £5 5s.).

Huddersfield.—Borough Council. Three 500-kW and three 300-kW transformers. Borough electrical engineer.

Kirkcudbright. — April 15th. County Council. Various works, including heating and domestic hot-water plant and electrical installation, in connection with the adaptation of mansion house as infectious diseases hospital. County Clerk.

London. — COMMISSIONERS OF H.M. WORKS.—April 26th. Installation of electric light and power services at H.M. Stationery Office, Harrow. (April 5th.)

Manchester.—April 19th. Electricity Committee. Kettles, meters, AC industrial motors and static transformers for one year. (April 5th.)

May 3rd. Chlorination plant for circulating water at Barton power station. (See this issue.)

April 26th. One 50-kW mercury-arc rectifier equipment. (See this issue.)

Newcastle-on-Tyne.—Committee of Visitors, Mental Hospital. Electric mixer and 100 c.f. electric automatic cabinet refrigerator.

Sheffield.—April 15th. Electricity Department. Transformer substation; J. R. Struthers, general manager and engineer.

South Africa.—JOHANNESBURG. — May 6th. Railway and Harbours Administration. Two 15-ton electric wharf cranes with 4-ton auxiliary hoists for Durban Harbour. (T. 17439/40.)*

Eleven 4-ton level luffing electric portal travelling wharf cranes. (T. 17640/40.)*

May 15th. City Council. Electric lamps. (T.Y. 17896/40.)*

SALISBURY (SOUTHERN RHODESIA).—May 14th. Electricity Department. 11,000-V, 3,300-V and 460-V p.i. cables, v.i.r. cables and cable boxes, for the new power station, Western Commonage. (T. 17617/40.)*

CAPE TOWN.—May 15th. Electricity Department. Nine 10-kVA and six 25-kVA 3-phase pole mounting distribution transformers. (T. 17372/40.)*

May 1st. Cables. (T.Y. 17884.)*

DURBAN.—May 3rd. General Stores Department. Overhead line material and steel stay wire. (T. 17338/40.)*

Stoke-on-Trent.—May 8th. Electricity Department. Overhead transmission line. (See this issue.)

Stourport-on-Severn.—April 18th. Urban District Council. Electrical installations in forty-eight houses at Park Crescent and Bewdley Road. Specifications from W. Rowbotham, housing manager, the Council House.

Warrington.—May 6th. Electricity Department. Transformers. (See this issue.)

West Hartlepool.—April 20th. Borough Council. One 5,000 kVA three-phase transformer, 20,000/5,760 V. (April 5th.)

West Midlands.—April 26th. J.E.A. 11-kV distribution switchgear for Oakengates switching station, Shropshire distribution area. (April 5th.)

Workington.—April 20th. Corporation. Two 750-kVA transformers. (See this issue.)

Wirral.—April 20th. Urban District Council. Supply and installation of a 3-in. horizontal non-chokeable pump and electric motor, for pumping crude sewage; surveyor, Council Offices, Heswall, Wirral.

Orders Placed

Barrow-in-Furness. — Electricity Committee. Accepted. Switchboard (£236). English Electric Co. Supplies for twelve months: Packing and jointing materials. —J. Walker & Co. Meter boards.—T. de Halle. Tinned copper wire and strip, disconnecting boxes, cables, copper wire and p.b.j. cables.—B.I. Cables. Extra-high-voltage and low-voltage insulating compounds and vaseline and resin oil. Dussek Bitumen & Taroleum. Meters and transformers.—English Electric Co. Meters.—Aron Electricity Meter; Sangamo-Weston; Landis & Gyr; Met.-Vick. Elecl. Co.; Measurement. Switch cut-outs, sealing chambers and feeder pillars.—W. Lucy & Co. Roadway covers (heavy duty), feeder pillars, cables and copper wire.—Henley's. Public lighting standards.—Concrete Utilities. Outdoor pole mounting switchgear. — George Ellison. Transformers.—British Electric Transformer Co.; Met.-Vick. Elecl. Co. Earthenware pipes and tee service boxes and stoneware ducts.—Albion Clay Co.; H. J. Baldwin & Co. Interlocking tiles. —Cable Covers. Insulators.—Electric Transmission. Cables.—Crompton Parkinson. Wire.—Richard Johnson & Nephew. Cables, flexible cords, conduits and fittings, miscellaneous wiring supplies and fuse boards and cut-outs.—W. R. Thornton. Switch sockets and plugs, switches, lampholders and ceiling roses.—H. Clarkson. Wood blocks and electric irons.—Downes and Davies. Cooker control units.—J. H. Tucker & Co. Electric kettles.—G.E.C. Wash-boilers.—Burco. Water heaters.—Santon. Cookers.—English Electric Co.; Hotpoint Electric Appliance Co.; Revo Electric Co.

Birkenhead. — Electricity Committee. Accepted. Lamps for twelve months.—Boula Reflector Lamp Co.; British Glow-lamp Works; Luxram Electric; Splendor Lamp Co.; Thorn Electrical Industries; Union Lamp and Lighting Co.; United Electric Co.; Vale Royal Electrical Lamp Manufacturing Co.

Birmingham.—Lift installation in the extensions to the premises in Corporation Street, for the Birmingham Gazette, Ltd.—Waygood Otis.

Blackburn.—Town Council. Accepted. 33,000-V single core cable.—Henley's. Three 500-kVA transformers.—English Electric Co.

Glasgow. — Corporation. Accepted. Repairs to generating set at Pinkston power station (£5,284). — Met.-Vick. Elecl. Co.

Hull.—Telephones Committee. Accepted. Cadmium copper wire (£503).—F. Smith & Co. Cable (£602).—B.I. Cables.

Electricity Committee. Contracts extended: Wash boilers.—Burco. Kettles and cooker terminal boards.—T. Beadle & Co. Time switches.—Horstmann Gear Co. Water heaters.—Berry's Electric. Immersion heaters.—Hotpoint Electric Appliance Co.; G.E.C. Lamp posts.—Revo Electric Co. Lamp brackets.—Wardle Engineering Co. Transformers. —Met.-Vick. Elecl. Co.; Yorkshire Electric Transformer Co.

Leeds.—Health Committee. Accepted. Electrical installation at nurses' home, Killingbeck sanatorium (£1,371).—N. G. Bailey & Co. X-ray plant for Gateforth sanatorium (£540).—General Radiological.

Financial Section (*Concluded from page 440*)

Reports and Dividends—contd.

Pinchin, Johnson & Co., Ltd., in a preliminary statement, report a net profit for 1939 of £355,547 as compared with £303,882 for 1938. Tax requires £120.000, leaving a balance available of £235,547. A sum of £53,486 is placed to reserve for depreciation of investments and contingencies, and the final ordinary dividend is 6 per cent., making 10 per cent. for the year (against 12½ per cent.). The balance carried forward is £120,882, an increase of £26,012.

The Skefko Ball Bearing Co., Ltd., reports a net profit for 1939 of £253,396, as compared with £251,168 for 1938. The final dividend is 7½d. per share, making 1s. for the year (against 1s. 6d.), free of tax. £50.000 is placed to general reserve, and £159.557 is carried forward (against £416,161 brought in).

The Melton Mowbray Electric Co., Ltd., reports a net profit for 1939 of £6,256, as compared with £6,177 for 1938. The final dividend is 6 per cent., making 10 per cent. for the year, and £1,456 is carried forward (against £1,377 brought in).

The Electric Supply Corporation, Ltd., is paying a final dividend of 8 per cent. on the ordinary shares (against 8½ per cent.), less tax at the standard rate ruling after the forthcoming Budget, making 11½ per cent. for the year (against 12 per cent.).

The United River Plate Telephone Co., Ltd., in a preliminary statement, reports a net income for 1939 of £613,676. as compared with £557,292 for 1938. The number of telephone stations at the end of the year was 387,514. as against 361,468 at December 31st, 1938.

The Pernambuco Tramways & Power Co., Ltd., has announced an interim dividend of 2 per cent. on the 5 per cent. first debentures on account of arrears.

Laurence, Scott & Electromotors, Ltd., report a net profit for 1939 of £105,638, as compared with £109,130 for the previous year. A first and final dividend of 15 per cent. is proposed (unchanged).

The Ever Ready Trust Co., Ltd., reports a net revenue for the year ended March 31st of £28,470. as compared with £28,084 for 1938-39. A final dividend is announced on the ordinary stock and deferred shares of 6 per cent., making 9 per cent. for the year (against 8 per cent.).

The St. Austell and District Electric Lighting and Power Co., Ltd., is paying a final dividend of 6 per cent., maintaining its distribution for the year at 10 per cent.

Housing Committee. Accepted. Electrical conduit work in connection with the Sweet Street re-development scheme.—Ward & Co. (Dewsbury).

Electricity Committee. Accepted. Switchgear (£31,884).—Ferguson, Pailin. Main steam piping (£7,376) and boiler equipment with unit mills and separate raw coal bunkers (£42,188). — International Combustion.

Accepted for one year: India-rubber covered cables, mains boxes and fittings, jointing and insulating materials.—William Geipel; Albion Electric Stores; Yorkshire Switchgear and Engineering Co.

Transport Committee. Accepted for one year: Electric lamps (general purposes).—Nox Electric Lamp Co. Electric lamps (automobile).—George Casperson.

Liverpool. — Water Committee. Accepted. Supply and erection at Lake Vyrnwy of a complete electrical installation, consisting of two turbo-generators, including switchboard, valves, pipework, &c. (£2,080).—Gilbert Gilkes & Gordon.

Electrical Power and Lighting Committee. Accepted. Coal grabbing crane (£7,712).—Babcock and Wilcox, Ltd. 5-ton mobile petrol electric crane (£1,120).—Ransomes & Rapier.

Smethwick.—Gas Committee. Accepted. Steam driven DC electric generating set (£1,012).—Belliss & Morcom.

Walsall.—Electricity Committee. Accepted. Switchgear (£143).—Ferguson, Pailin. Cookers (extension for twelve months).—Jackson Electric Stove Co.

Wallasey.—Electricity Committee. Accepted. Steel rectifier bulb (£160).—English Electric Co.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Acton.—Extensions to works for Expandite Products, Ltd.; Allnatt, Ltd., contractors, Chase Estate, Park Royal, London, N.W.10.

Ashby-de-la-Zouch.—Cinema, Station Road; A. J. Thraves & Son, architects, Whitefriars House, Friar Lane, Nottingham.

Ashton-under-Lyne. — Extensions to Ryecroft Mill; Cooke & Ferguson, Ltd., Victoria Steel Works, Manchester.

Biggleswade.—Factory extensions, for Fully Fashined Hosiery Co., Ltd., London Road, Baldock.

Billing.—Extensions to mills for Willett & Bartram, Ltd.; F. H. Allen, architect, 24, Albion Place, Northampton.

Bingley.—Houses (42), Micklethwaite Lane; J. Brown & Sons.

Substation, Albion Mills, Wilsden; S. H. Rawnsley, Ltd.

Birmingham.—Additions to works of Charlesworth's Mouldings, Ltd., Northcote Road, Stechford.

Additions to works of Lambournes, Ltd., Great Hampton Row; Morris, Jacombs & Son, builders, Small Heath.

Additions to works of Guest, Keen & Nettlefolds, Ltd., Grove Street, Smethwick; W. & J. Webb & Son, builders, Soho Hill, Birmingham.

Blackburn.—Extensions for Hindle, Son & Co., Union Engineering Works, Witton; J. Haworth, architect, Victoria Estate Building, Cort Street.

Blackpool.—Laundry extension in Talbot Road for the Blackpool Princess & Ribble Laundries, Ltd.; Chadwick Bros. (Layton), Ltd., contractors, Layton Saw Mills, Blackpool.

Bognor.—Factory on Bognor Lodge estate, for Shirley Bros., 10, Bath Street, London, E.C.1; Lyons, Israel & Elsom, architects, 6, Bryanston Street, London, W.1.

Bolton.—Works additions, Lever Street; Wm. Walker & Sons, Ltd.

Burton-on-Trent.—Rebuilding the Bear Inn, Horninglow Street, Stapenhill, for Marston, Thompson & Evershed, brewers of Burton-on-Trent.

Carlisle.—Infirmary (£214,000); County Council and City Council.

Chadwell Heath.—Factory, High Street; Toolpro, Ltd.

Chesterton.—New isolation hospital, for R.D.C.; surveyor, Council Offices.

Cippenham.—Church hall, Elmshott Lane; Slough Baptist Church trustees.

Corby (NORTHANTS).—Fire station, Kelvin Grove; D. W. Greaves, surveyor, Council Offices.

Coventry.—Offices and stores, Puma Road, and extensions to factory, for Armstrong Siddeley Motors, Ltd.

Extensions to works for Chas. Weston & Co., Torrington Avenue; Harris & Son, contractors, 50, Cope Street.

Dagenham.—New factory in Selinas Lane, for W. A. Smith & Co., Boleyn Castle, East Ham.

Durham.—Hospital for Durham County Orthopædic Association (application to be made to Government to allow work to proceed), £120,000; W. and T. R. Milburn, architects, 17, Fawcett Street, Sunderland.

Rebuilding factory of Adams (Durham), Ltd., confectioners, destroyed by fire.

Houses (208); R.D.C. architect, Byland Lodge, Durham.

Eastbourne.—Offices, Compton Place Road; National Amalgamated Approved Society.

Essex.—Extension scheme, Oldchurch County Hospital, Romford (£3,792); county architect, Chelmsford.

Flintshire.—Infants' department of junior school at Flint (£12,000); R. G. Whitley, county architect, County Offices, Mold.

Guildford.—Factory alterations, Bypass Road; Warner Engineering Co.

Halesowen.—Extensions to works; Jas. Grove & Son, Stourbridge Road.

Hanley.—Works additions, Hampton Street; Taylor Tunnicliffe & Co., Ltd.

Higham Ferrers.—Bungalows (12), for Town Council; Potter and Sons.

Huddersfield.—Erection of "Maypole" Hotel, Bracken Hall estate, Sheepridge, for Bentley & Shaw, Ltd., Lockwood; Abbey and Hanson, civil engineers, 11, Cloth Hall Street, Huddersfield.

Ilford.—Works additions, Vicarage Lane; Plessey Co., Ltd.

Jarrow (CO. DURHAM). — Cleansing stations; W. Lax & Co., contractors, Crook, Co. Durham, and D. Glen, Back Queen's Road, Jarrow.

Kidderminster.—Extensions to weaving sheds, Hill Street, for Carpet Manufacturing Co., Ltd.

Lanarkshire.—Extensions to Rosebank Works, Cambuslang, for James Mitchell & Sons.

Lancashire.—Extensions, Burtonwood School, and proposed schools, Atherton, and Broughton-in-Preston; county architect, County Offices, Preston.

Liverpool.—Rebuilding portion of premises for Henry Wilson & Co., Ltd., Cornhill Works, Cornhill, Liverpool; Roberts and Sloss, Ltd., contractors, 19, Baker Street, Liverpool, 6.

Reconstruction of "Abercromby" Hotel, Mount Pleasant, for Peter Walker & Son, Warrington, and Burton, Ltd., 105, Duke Street, Liverpool, 1; A. Ernest Shennan, architect, North House, North John Street, Liverpool.

London.—DEPTFORD. — Machine shop, Ashby Mews; H. Hepplethwaite (Automatics), Ltd.

WALWORTH.—Laundry, East Street; Andrews & Gale.

W.C.—Proposed new hospital (£200,000), Gray's Inn Road, for Golden Square Throat, Nose and Ear Hospital, and the Central London Throat, Nose and Ear Hospital.

Longdon.—New hospital at Lysways, for Mid Staffs Joint Hospital Board.

Macclesfield.—Reconstruction of kitchen at Infirmary; F. Fowler, architect, Westminster Bank Chambers.

Manchester.—Works at Trafford Park; Ford Motor Co., Dagenham, Essex.

Extensions to works, for Brayshaw Furnace & Tools, Ltd., Belle View Works, Boundary Street; H. Burke & Son, architects, 15a, Green Lane.

Maidstone.—Modernisation of Isolation Hospital, Fant Lane (£12,000); borough engineer.

Mexborough.—Houses, Roman Terrace, for U.D.C.; surveyor, Council Offices.

Newcastle-on-Tyne.—Hotel at Fawdon, for Arrol and Sons; C. S. Errington, architect, 46, Grainger Street, Newcastle-on-Tyne.

Northampton.—Pumping station, near West Bridge; borough engineer, Guildhall.

Northern Ireland. — BELFAST.—Proposed branch library, adjoining Grove Playing Fields, for Libraries Committee; borough engineer.

Rowley Regis.—Fire station, Mace Street, Old Hill; Clifford Buckley, town clerk, Municipal Buildings, Old Hill, Staffs.

Rugeley.—Rebuilding the Red Lion Inn, Market Street, Rugeley, for City Brewery Co. (Lichfield), Ltd., 7, Lovatt Street, Wolverhampton.

Sheffield. — Extensions for William Jessop & Sons, Ltd., Brightside Works.

Works extension for Daniel Doncaster & Sons, Ltd., Penistone Road, Owlerton, Sheffield, 6.

Office, Edmund Road, for Aurora Gearing Co. (Wilmot North), Ltd., Edmund Street, Sheffield, 2.

Workshops, warehouses and laboratory, for Watson, Saville & Co., Ltd., Mowbray Street, Sheffield, 3.

Shrewsbury.—Extensions to factory, Harlescott, for Chatwood Safe Co., Ltd.; J. R. Deacon, contractor, Lombard Street, Lichfield.

Skipton.—Tannery extensions, for J. Brooksbank, Son & Co.; J. Howard Wales, architect, Exchange Buildings, Liverpool.

Smethwick.—Works additions, Windmill Lane; Payne & Griffiths.

South Shields.—Factory additions, St. Hilda Street, for the Wire Rope Co., Ltd.; F. W. Newby, architect, 10, King Street, South Shields.

Shop at Westoe, for Jarrow & Hebburn Co-operative Society; C.W.S. Building Dept., West Blandford Street, Newcastle.

Stoke-on-Trent. — Office block, N.S. Royal Infirmary, Princes Road; governors.

Additions, Carlton works, Copeland Street; Wiltshaw & Robinson, Ltd.

Stokesley.—Fire station; Kitching and Co., architects, 21, Albert Road, Middlesbrough.

Sunderland.—Alterations and additions, for the Sunderland Winch and Foundry Co., Borough Road; Matkin and Hawkins, architects, Barclays Bank Chambers, Fawcett Street, Sunderland.

Tipton.—Factory, for Threadgill Electro Deposits, Ltd., Union Street, Tipton; J. Edwards & Sons, contractors, Oxford Street, Dudley.

Additions to Horseley Engineering Works, Horseley Road, for Horseley Bridge and T. Piggott, Ltd.

Office and works, Locarno Road, for Lockerbie and Wilkinson (Tipton), Ltd., Alexandra Works, Tipton; F. J. Timins, contractor, Sedgley Road, Woodsetton, near Dudley.

Extensions to works, for Lee, Howl & Co., Ltd., Tipton; Mark Round & Sons, Ltd., contractors, New Street, Dudley.

Torquay.—Conversion, Carlton Club into offices (£1,830); borough engineer.

Totnes.—Pumping station, Avonwick, Devon, for R.D.C.; Lemon & Blizard, engineers, 24, Lockyer Street, Plymouth.

Tottenham.—Rebuilding central baths, extensions to Bromley Road slipper baths, and baths and wash-houses, The Hale; borough engineer, Town Hall, The Green, N.15.

Trevor (CAERNARVONSHIRE).—Extensions for the Penmaenmawr and Welsh Granite Co., Ltd.

Tunstall.—Warehouse, Newfield Pottery, High Street; A. Meakin, Ltd.

Twickenham.—Workshop and additions, Oldfield Works, Hampton; Hall and Hall, Ltd.

Store, &c., York Street; Brewer, Smith and Brewer, architects, 11, The Green, Richmond.

Walsall. — Rebuilding "Market Tavern," Freer Street, for Lichfield Brewery Co., Ltd., 120, Station Street, Burton-on-Trent.

Welshpool.—Public abattoir; borough engineer.

Wolverhampton. — Works additions, Marston Road; Star Aluminium Co., Ltd.

Pumping station, Coven Heath; borough engineer.